International Conference

Modern Trends in Physics

01-03 May 2019, Baku

Dedicated to the 100th anniversary of

BAKU STATE UNIVERSITY

Program and Abstracts

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GENERAL INFORMATION

Host organization:
Baku State University (BSU), Baku, Azerbaijan

Co-organizers:
1. Ministry of Education of the Republic of Azerbaijan
2. Regional Network for Education and Training in Nuclear Technology (STAR-NET), Vienna, Austria
3. Joint Institute for Nuclear Research (JINR), Dubna, Russia
4. Sapienza University of Rome, Rome, Italy

Topics:
1. Nano, -opto electronics and Materials Science;
2. Theoretical, Mathematical and High Energy Physics;
3. Physical and Technical Foundations of the Alternative Energy Sources;
4. Biological and Medical Physics;
5. Condensed Matter Physics.

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PROGRAM
Wednesday, May 01, 2019

Venue: Z.Khalilov 23, Conference Hall, New Building of BSU

09:30-10:30 AM
Registration

10:30-11:00 AM
Welcome speech by ELCHIN BABAYEV, the Rector of Baku State University and Others

Plenary Session
Moderator(s):
M.A.RAMAZANOV, M.R.RAJABOV

11:00-11:20 AM
NARITAKA KOBAYASHI
ATOMIC-SCALE IMAGING OF HYDRATED WATER MOLECULES AT A SOLID-LIQUID INTERFACE BY ATOMIC FORCE MICROSCOPY

11:20-11:40 AM
A.M.PASHAYEV, A.A.MUSAYEV, B.G.TAGİYEV, N.A.VELİYEV, Y.M.BAGHİROV, K.R.ALLAHVERDİYEV, I.Z.SADİKHOV
DISTINCTIVE FEATURES OF EMISSION SPECTRA OF CRUDE OILS OF THE ABSHERON PENINSULA

11:40 AM -12:00 PMCoffee Break

12:00-12:20 PM
PAVLE ASATIANI
CIRCULATION PHYSICAL FUNDAMENTALS OF COMPUTING AND TECHNOLOGIES

12:20-12:40 PM
NIZAMI HASANLI
LOW TEMPERATURE THERMOLUMINE¬SCENCEC STUDYING Y_2O_3 NANOPARTICLES

12:40-13:00 PM
ARCHIL CHIRAKADZE, D.JISHIASGVILI, N.MITAGVARIA, I.LAZRISHVILI, Z.SHIOLASHVILI, A.JISHIASGVILI, N.MAKHATADZE, Z.BUACHIDZE, N.KHUSKIVADE
STUDIES OF THE COMPARATIVELY LOW-TEMPERATURE SYNTHESIS AND PRELIMINARY TOXIC CHARACTERISTICS OF SILVER DOPED LANTHANUM MANGANITE NANOPARTICLES USING CONVENIENT AND MICROWAVE HEATING

13:00-14:20 PM Lunch

14:30-14:50 PM
IMAN ASGARZADA
INFLUENCE of THERMAL FLUCTUATIONS ON CRITICAL CURRENT of JOSEPHSON JUNCTION WITH UNCONVENTIONAL CURRENT-PHASE RELATION

14:50-15:10 PM
A.G. KYAZYM-ZADE, V. SALMANOV, A.G. HUSEYNOV, R.M. MAMEDOV
DEVELOPMENT OF LASER PHYSICS

15:10−15:30 PM
VALI HUSEYNOV, R. GASIMOVA
POLARIZED ELECTRON TARGETS AS UNIQUE TOOL FOR THE DISTINGUISHING OF THE FLAVOUR COMPOSITION OF THE NEUTRINO (ANTINEUTRINO) BEAM

15:30−15:50 PM
AMDULLA O. MEKHRABOV, M. VEDAT AKDENIZ
DESIGN AND DEVELOPMENT OF HEUSLER ALLOYS FOR MAGNETIC REFRIGERATION APPLICATIONS

15:50−16:10 PM
ELDAR MASIMOV
SEPARATING ABILITY OF TWO-PHASE WATER-POLYMER SYSTEMS

18:00 Dinner

Thursday, May 02, 2019

Parallel Session (s)

Room: The main building of BSU, auditorium 111

Nano, -opto electronics and Materials Science

Moderator(s)
AHMED ABDINOV, FAIG PASHAYEV

10:00−10:15 A.SH.ABDINOV, R.F.BABAYEVA, N.A.RAGIMOVA
DEPENDENCE OF PHOTOCONDUCTIVITY ON THE ELECTRICAL FIELD IN n-InSe

10:15−10:30 A.SH.ABDINOV, R.F.BABAYEVA, S.İ.AMIROVA
INFLUENCE OF EXTERNAL AND INTRACRYSTALLINE FACTORS ON THE MOBILITY OF CHARGE MEDIA IN n-InSe SINGLE CRYSTALS

10:30−10:45 A.M.AHMEDOVA
THERMAL CONDUCTIVITY $InTlIn_{1-X}YB_XSe_2$ SOLID SOLUTIONS

11:00−11:15 N.M.AKHUNDOVA
ELECTRIC CHARGE AND HEAT TRANSFER IN SnTe CRYSTALS WITH DIFFERENT VACANCY CONCENTRATIONS IN TIN SUBLATTICE

11:15−11:30 E.SH. ALAKBAROV
SUPERSTRUCTURE FORMATION IN $TlIn_{1-x}Sn_xS_2$ EPITAXIAL FILMS

11:30−11:45 S.Z. JAFAROVA
THE ROLE OF EXCITONS IN THE FORMATION A PHOTOCURRENT IN A $TlGaSe_2$ SINGLE CRYSTAL

11:45−12:00 Cofee Break

12:15−12:30 H.B.GASIMOV, N.E.HASANOV, R.M.RZAYEV, H.M.MAMMADOV,V.U.MAMMADOV
FABRICATION OF $Cu_{1.75-x}In_xTe$ AND INVESTIGATION OF STRUCTURE TRANSITION(x= 0.05 at.%)

12:30−12:45 H.M.MAMMADOV, M.A.JAFAROV, E.F.NASIROV, E.A.CHANMAMMADOVA, G.H.MAMMADOVA
EFFECT OF TEXTURING REGIMES ON THE EFFICIENCY OFp-Si/textured-Si/$ZnS_{1-x}Se_x$ HETERO-JUNCTIONS SOLAR CELLS

12:45−13:00SH.A.HUMBATOV, A.R.IMAMALIYEV, M.A.RAMAZANOV, G.M.BAYRAMOV
SIZE EFFECTOF SMALL FERROELECTRIC $BaTiO_3$PARTICLES ON DIELECTRIC PROPERTIES OF A SMECTIC A LIQUID CRYSTAL WITH NEGATIVE DIELECTRIC ANISOTROPY

13:00−14:00 Lunch

14:00−14:15 T.KH.HUSEYNOV, K.M.DASHDAMIROV, G.I.GARIBOV, V.H. SAFAROV, E.A. RASULOV, SH.A. ALLAHVERDIYEV
ELECTRIC DOUBLE LAYER INRAPIDLY CHANGING HELIUM PLASMA COLUMN

14:15−14:30 K.M.BUDAGOV, G.M.BAYRAMOV, CH.I.IBRAGIMOV, SH.SH.ALAKBAROV
VOLTAMPER CHARACTERISTICS AND TEMPERATURE DEPENDENCEELECTRIC CONDUCTIVITY OF THICK LAYERS OF LIQUID CRYSTALS

14:30−14:45 T.G.KERIMOVA, I.A.MAMEDOVA, L.Y.KENGERLINSKI, N.A.ABDULLAYEV, Z.KADIROGLU, N.T.MAMEDOV
TEMPERATURE DEPENDENCE OF RAMAN SPECTRUM OF $CdGa_2Se_4$

14:45−15:00 L.H.GASANOVA, A.Z.MAHAMMADOV, A.A.AHMED
LUMINESCENCE OF $Cu_3In_5S_9$ SINGLE CRYSTAL

15:00−15:15 M.A.RAMAZANOV, ANGELO CHIANESE, F.V.HAJIYEVA, A.A.NOVRUZOVA
INFULENCE OF THERMAL TREATMENT ON PHOTOLUMINISCENTPROPERTIES OF PP/PbS/CdS NANOCOMPOSITES

15:15−15:30 M.S.MURGUZOVA, SH.S.ISMAYLOV, A.I.HASANOVA
ELECTRICITY CONDUCTIVITY OF COMPENSATED $Gd_xSn_{1-x}Se$ CRYSTALS AND ANOMALOUS CHANGE OF HOLL'S COEFFICIENT

15:30−15:45 MOHAMMADREZA SABOKTAKIN
THE DEVELOPMENT OF PHOTODYNAMIC THERAPY TECHNIQUE FOR CANCER TREATMENT WITH NEW NANOPARTICLES

15:45−16:00 F.A.RUSTAMOV, N.H.DARVISHOV, V.E.BAGIYEV, M.Z.MAMMADOV, G.M. EYVAZOVA, E.Y.BOBROVA, H.O. QAFAROVA
ROLE OF OXYGEN AND HIDROGEN BONDS IN PHOTOLUMINESCENCE OF POROUS SILICON

16:00−16:15 R.K. MAMMADOV, A.R.ASLANOVA, P.O.GANIZADE, A.A.MUSAYEVA
TEMPERATURE DEPENDENCE OF THE VOLTAGE OF ADDITIONALELECTRIC FIELD METAL - GaAs SCOTS DIODES

16:15−16:30 O.B.TAGIYEV, T.G.NAGHIYEV, E.G.ASADOV, K.O.TAGIYEV
EFFECT OF THE EXTERNAL INFLUENCES ON PHOTOLUMINESCENCE EFFICIENCY AND DECAY OF Eu^{2+} DOPED $Ca_xBa_{1-x}Ga_2S_4$ AND $Ca(Al_xGa_{1-x})_2S_4$ SYSTEMS

16:30−16:45 B.SH.BARKHALOV, M.M.TAGIYEV, G.J.ABDINOVA
MAGNETOTHERMOELECTRIC PROPERTIES OF THERMAL ELEMENTS ON THE BASIS OF CRYSTALS OF SOLID SOLUTIONS BISMUTH-ANTIMONY AND BISMUTH TELLURIDE-ANTIMONY TELLURIDE

16:00−16:15 D.JISHIASHVILI, A.CHIRAKADZE, Z.SHIOLASHVILI, N.MAKHATADZE, A.JISHIASHVILI, V.GOBRONIDZE
VAPOR-PHASE SYNTHESIS OF COPPER-BASED NANOSTRUCTURES

16:15−16:30 M.A.RAMAZANOV, H.A.SHIRINOVA
FLUCTUATION OF THE MAGNETIC MOMENT OF MAGNETITE PARTICLES DEPENDING ON THE SIZE OF PARTICLES

16:30−16:45 M.A. MEHRABOVA, H.S. ORUJOV, H.R. NURIYEV, N.H. HASANOV, A.A. ABDULLAYEVA, Z.I. SULEYMANOV
AB-INITIO CALCULATIONS OF ELECTRONIC STRUCTURE OF CdFeTe AND OPTICAL PROPERTIES

16:45−17:00 M.A. MEHRABOVA, H.R. NURIYEV, N.H. HASANOV, T.I. KERIMOVA, A.I. KAZIMOVA, N.A. SAFAROV, A.M. NAZAROV
DIELECTRIC PROPERTIES OF CdMnTe(Se) SEMIMAGNETIC SEMICONDUCTORS

17:00−17:15 M.A. RAMAZANOV, F.V. HAJIYEVA
SYNTHESIS AND STRUCTURE OF HYBRID POLYMER NANOCOMPOSITES BASED ON PP +CdS/ZnS

17:15−17:30 M.M. ZARBALIEV, M.H. ISMAYILOV, N.S. SARDAROVA
ON THE FORMATION AND ELECTROPHYSICAL PROPERTIES OF SOLID SOLUTIONS $TlIn_{1-x}Dy_xS_2$

Thursday, May 02, 2019

Parallel Session(s)

Room: The main building of BSU, auditorium 316

Theoretical and Mathematical and High Energy Physics

Moderator(s)
PAVLE ASATIANI, RAUF JAFAROV

10:00−10:15 M. DVORNIKOV
RELATIVISTIC QUANTUM MECHANICS DESCRIPTION OF NEUTRINO SPIN-FLAVOR OSCILLATIONS IN MATTER AND A PLANE ELECTROMAGNETIC WAVE

10:15−10:30 A.M. AHMADOVA, S.Z. JAFAROVA
ON THE ISSUE OF REDUCING HARMFUL NOISEIN THREE-PHASE VIBRATORS

10:45−11:00 Z.F. ALIYEVA
STUDY OF CHANGE WIDES OF CORONAL SPECTRAL LINES AT HEIGHT IN CROWN AND SUN DISK

11:00−11:15 D.M. KULI-ZADA, S.G. MAMMADOV, Z.F. ALIYEVA
SPECTROPHOTOMETRIC CHARACTERISTICS AND PARAMETERSASYMMETRIES OF INFRARED LINES IN THE SPECTRA OF THE SUN

11:15−11:30 D.M. KULI-ZADA, S.H. MAMADOV, K.I. ALISHEVA
ASSYMETRY CLASSIFICATION IN THE SPECTRUM OF THE SUN

11:30−11:45 C.M. KULI-ZADZ, K.I. ALISHEVA, A.H.ALILI
PRECISE DIFFUSION COEFFICIENT FOR PLANETARY NEBULAE AND ITS RELATION TO DYNAMIC AGE

11:40−12:00 E.M. HASANOV, Z.H. TAGIYEV, A.A. ABDINOVA, N.A. AKHMEDOV
THEORETICAL CONFORMATIONAL ANALYSIS OF THE C-TERMINAL TETRAPEPTIDE FRAGMENT OF THE BAM-22P

12:00−12:15 Cofee Break

12:15−12:30 E.P. NAHKMEDOV, S.M. PASHAYEV
EDGE STATES IN CORBINO DISK IN THE PRESENCE OF RASHBA AND DRESSELHAUS SPIN-ORBIT INTERACTIONS

12:30−12:45 S.K. ABDULLAYEV, E.SH. OMAROVA
THE DECAYS OF $\boldsymbol{H(h;A)}$ HIGGS-BOSONS INTO TWO PHOTONS

12:45−13:00 F.I. ISMAYILOV
THE METHOD OF ATMOSPHERIC CORRECTION OF SATELLITE IMAGES.RESTORE SPECTRAL BRIGHTNESS OF THE EARTH'S SURFACE

13:00−14:00 Lunch

14:00−14:10 G.R. BAHADDINOVA, U. BASHIROVA, N.Z. ISMAYILOV
Hα AND Hβ LINES IN THE SPECTRUM OF THE Ae HERBIG STAR HD190073

14:10−14:20 D.M. KULI-ZADA, S.G. ALIYEV, V.M. KHALILOV, S.N. GULAHMADOVA
CHANGE OF BALMER JUMP IN MAGNETIC CP-STARS

14:20−14:30 H.N. ADIGOZALZADA, U.Z. BASHIROVA
SPECTRAL VARIABILITY H_β LINE OF THEAeHERBIG TYPE STAR HD 179218

14:30−14:40 G.C. ABBASOVA, L.S. HAJIYEVA, G.R. SAFARLI
THE STUDY OF THE SPATIAL STRUCTURAL ORGANIZATION OF THE MOLECULEOF THE HERPES VIRUS

14:40−14:50 I.G. AFANDIYEVA, R.A. AHMEDOV
GENEALOGICAL COEFFICIENTS OF KINSHIP IN THE DIRECT NUCLEAR REACTIONS

14:50−14:30 I.N. ASGARZADA, R.T. ASGARBAYLI
THERMAL ACTIVATION in SMALL JOSEPHSON JUNCTION

15:30−15:45 L.I. ISMAYILOVA, R.M. ABBASLI, N.A. AHMADOV
SPATIAL STRUCTURE OF ARGININ-CONTAINING PENTAPEPTIDES

15:45−16:00 M.M. BABAYEV, KH.B. SULTANOVA, M.Q. ABBASLI
MOBILITY OF ELECTRONS IN A SEMICONDUCTOR QUANTUM WELL WITH THE MODIFIED PÖSCHL-TELLER CONFINING POTENTIAL

16:00−16:15 R.G. JAFAROV
DESCRIPTION OF THE DECAY $\sigma \to \pi\pi$ IN QUANTUM FIELD THEORY

16:15−16:30 MAIS SULEYMANOV
THE COLLECTIVE BEHAVIOR OF THE PARTONS AND ITS INFLUENCE ON THE JET SUPPRESSION IN HEAVY ION COLLISIONS

16:30−16:45 N.A. HUSEYNOV, V.L. OKNYANSKY, KH.M. MIKAILOV,V.M. LIPUNOV, V.I. METLOV, N.I. TAGHIYEVA
CHARACTERISTIC FEATURES OF THE CHANGE OF THE SPECTRAL TYPE OF THE SEYFERT GALAXY NGC 2617

16:45−17:00 N.Z. ISMAYILOV, G.B. MAMMADKHANOVA
SURFACE PHOTOMETRY OF ORION PROPLYDS

17:00−17:15 J.S. ALIYEV
SOME PROBLEMS OF THE DATA ANALYSIS

17:15−17:30 S.P. PASHAYEV
INVESTIGATING THE EFFECT OF METHANOL AND RHODAMINE ON SILK FIBROIN STRUCTURE THROUGH FTIR SPECTROSCOPY

Thursday, May 02, 2019

Parallel Session(s)

Room: The main building of BSU, auditorium 125
Physical and Technical Foundations of Alternative Energy Sources

Moderator(s)
AMIL MAHARRAMOV

10:00−10:15 N.A.YUSIFBAYLI, R.K. KALBIYEV
SOLAR ENERGY POTENTIAL OF THE REPUBLIC OF AZERBAIJAN

10:15−10:30 N.A. RAMAZANLI
THEROLE OF PROGNOSIS AND ITS ESTIMATION IN THE MANAGEMENT OF CONSTRUCTION FIELD DEVELOPMENT

10:30−10:45 A.M. MAHARRAMOV, G.SH. MEHDIYEVA, L.A. AGAMALIYEVA, R.SH. SHAFAGATOV
RENEWABLE ENERGY IN FOCUS: PECULIARITIES OF THE LOCAL RELIEF DEPENDENT MOUNTAIN-VALLEY WINDS

10:45−11:00 R.Z. RASULOV
ANALYSIS OF GEOMETRIC MODELING IN DESIGN

11:15−11:30 A.M. MAHARRAMOV, E.A. GARIBLI, G.SH. MEHDIYEVA, R.SH. SHAFAGATOV
ADJUSTMENT OF CONSUMPTION ELECTRIC ENERGY IN CONDITIONS OF TRANSITION PERIOD

11:30−11:45 A.M. MAHARRAMOV, R.SH. SHAFAGATOV
ISSUES OF ECONOMIC PROBLEMS SOLVING OF RENEWABLE ENERGY SOURCES ACQUISITION

11:45−12:00 Cofee Break

12:00−12:15 J. SAFAROV, A. GULUZADE, KH.SULEYMANLI, E. HASSEL
IONIC LIQUIDS AS HEAT TRANSFER FLUIDS IN SOLAR THERMAL SYSTEMS

Thursday, May 02, 2019

Parallel Session(s)

Room: The main building of BSU, auditorium 112

Biological and Medical Physics

Moderator(s)
ELDAR MASIMOV, NIFTALI GODJAEV

10:00−10:15 G.A. AGHAYEVA, U.T. AGHAYEVA, N.M. GOJAYEV
MOLECULAR MECHANICS AND DYNAMICS STUDY OF HYPOTENSIVE PEPTIDE NOVOKININ

10:15−10:30 A.B. ISMAYILOVA
ZEISS MICROSCOPES IN BIOMEDICAL RESEARCH

10:30−10:45 L.N. AGHAYEVA, A.A. ABDINOVA, S.R. AHMADOVA, N.F. AHMADOV
SPATIAL STRUCTURE OF ACTH- (7-10)-PGP MOLECULES

10:45−11:00 N.M. GOJAYEV, G.A. AGHAYEVA, U.T. AGHAYEVA
COMPARATIVE STUDY OF CONFORMATIONAL BEHAVIOUR OF ANGIOTENSIN CONVERTING ENZIME INHIBITORY TRIPEPTIDES

11:00−11:15 N.A. AHMADOV, R.M. ABBASLI, L.N. AGHAYEVA, L.I. ISMAYILOVA
THREE-DIMENSIONAL STRUCTURE OF EXORPHIN B5 MOLECULE

11:15−11:30 E.A. MASIMOV, A.H. ASADOVA, S.R. BAGHIROVA, V.V. PRUDKO
THE TEMPERATURE DEPENDENCE OF INTRINSIC VISCOSITY OF AGAROSE`S LIQUID SOLUTIONS

11:30−11:45 E.A. MASIMOV, B.G. PASHAYEV, N.F. ORUJOVA, M.F. YUSUBOVA
THE PARAMETERS OF VISCOUS FLOW ACTIVATION OF THE SYSTEMS WATER-PEG-LiOHAND THE PARTIAL MOLAR VOLUMES OF POLYETHYLENE GLYCOL IN SOLUTIONS

11:45−12:00 Cofee Break

12:00−12:15 G.A. AKVERDIYEVA, S.D. DEMUKHAMEDOVA, N.M. GOJAYEV
THEORETICAL STUDY OF THYMOMIMETIC PEPTIDE H-LYS-GLU-OH (VILON) AND ITS COMPLEX WITH THE RECEPTOR

12:15−12:30 G.J. ABBASOVA, E.Z. ALIYEV, G.R. SAFARLI
CONFORMATIONAL MOBILITY OF SIDE CHAINS OF THE MOLECULE CYS-ARG-GLU-LYS-ALA

12:30−12:45 E.A. MASIMOV, B.G. PASHAYEV, N.V. NIFTULLAYEVA, M.E. HASHIMOVA
STUDYİNG OF STRUCTURAL CHARACTERISTICS IN WATER-POLYETHYLENE GLYCOL-LIOH, NAOH, KOH SYSTEMS BY VISCOSIMETRY ANDPYCNOMETRY METHODS

12:45−13:00 E.A. MASIMOV, B.G. PASHAYEV, M.R. RAJABOV, L.P. ALIYEV
VISCOZYMETRIC STUDY OF AQUEOUS SOLUTIONS LiOH, NaOH AND KOH

13:00−14:00 Lunch

14:00−14:15 G.G.VALIYEVA, LUCA DI PALMA, S.R. HAJIYEVA, M.A. RAMAZANOV, F.V. HAJIYEVA
FE/PD BIMETALLIC NANOPARTICLES IN WATER REMEDIATION AND NITRATES TREATMENT

14:15−14:30 I.S. AHMADOV, M.A. RAMAZANOV
INTERACTION OF PROTEIN AND STARCH MOLECULES WITH NANOPARTICLES

14:30−14:45 M.A. GURBANOV, B.H. KHUDAYAROV, Z.A. DADASHOV, I.S. RAMAZANOVA, U.V. YUSIFOVA, S.A. NABIYEVA
BOUNDARY EFFECTS IN POLYMER COMPOSITES - POWERED CERAMICS

14:45−15:00 S.R.BAGIROVA, KH.T. HASANOVA
THE REOLOGICAL PROPERTIES OF LIQUID SOLUTIONS OF PVP

15:00−15:15 S.R. SLAVOLJUB
A SIMPLE EXPERIMENT FOR PROVING GREEN HOUSE EFFECT

Thursday, May 02, 2019

Parallel Session(s)

Room: The main building of BSU, auditorium 335

Condensed Matter Physics

Moderator(s)
SOFYA FIGAROVA, RENA KASUMOVA

10:00−10:15 T.H. ISMAYILOV, A.F. ASLANLI
SPECIFIC HEAT AND MAGNETIZATION OF THE FERMI GaS IN SEMICONDUCTOR NANOTUBE WITH SPIN-ORBITAL RASHBA INTERACTION

10:15−10:30 M.M. PANAHOV, S.N. SARMASOV, R.SH. RAHIMOV, T.SH. ABDULLAYEV
MANUFACTURE OF FILM RESISTANCE

10:30−10:45 A.M. BABANLI, B.G. IBRAHIMOV
MAGNETIC MOMENT OF THE LATTICE OF NON-INTERACTING DILUTED MAGNETIC SEMICONDUCTOR QUANTUM RING

10:45−11:00 E.R. HASANOV, R.K. MUSTAFAYEVA
ENERGY RADIATION IN IMPURETY SEMICONDUCTORS IN AN EXTERNALELECTRIC FIELD

11:00−11:15 R.J.KASUMOVA, N.V.KARIMOVA, G.A.SAFAROVA, A.R.AHMADOVA
BACKWARD SECOND HARMONIC WAVE IN REGULAR DOMAIN STRUCTURES

11:15−11:30 S.M. USEYNOVA
VARIATION METHODS OF MEASURING OF DIELECTRIC PARAMETERS

11:30−11:45 S.C. TARIVERDIYEV, R.R. BITSKIY, M.R. BUTAYEV, V.A. REUTSKY
OPTIMIZATION OF THE DIOD-PUMPED SOLID-STATE LASER PARAMETERS OF A SOLID-STATE Nd: YAG WITH TRANSVERSE PUMPING BY LASER DIODE

11:45−12:00 Cofee Break

12:00−12:15 SH.SH. AMIROV, R.J. KASUMOVA, Z.H. TAGHIYEV
ENERGY OF ULTRA SHORT PULSES IN METAMATERIALS

12:15−12:30 S.R. FIGAROVA, M.M. MAHMUDOV
EFFECT OF THE ENERGY SPECTRUM NONPARABOLICITY ON THE ENTROPY OF A COMPLEX SHAPE QUANTUM WELL

12:30−12:45 S.R. FIGAROVA, V.R. FIGAROV
STATISTICS OF SYSTEMS WITH CORRELATED STATES

12:45−13:00 V.M. SALMANOV, A.G. HUSEYNOV, R.M. MAMMADOV, A.A. SALMANOVA
THE DESTRUCTION OF TRANSPARENT DIELECTRICS UNDER THE ACTION OF LASER RADIATION

13:00−14:00 Lunch

14:00−14:15 MAHMUT AYDINOL
FOLLOWING ELECTRON IMPACT EXCITATION OF SINGLE(93Np, 94Pu, 95Am, 96Cm, 97Bk, 98Cf) ATOMS O SUBHELL IONIZATION CROSS SECTIONS BY USING LOTZ'S EQUATIONS

14:15−14:30 MAHMUT AYDINOL
FOLLOWING ELECTRON IMPACT EXCITATION OF SINGLE(99Es, 100Fm, 101Md, 102No, 103Lr, 104Rf) TRANSURANIC ATOMS O SUBHELL IONIZATION CROSS SECTIONS BY USING LOTZ'S EQUATIONS

Friday, May 03, 2019

Parallel Session(s)

Room: The main building of BSU, auditorium 111

Nano, -opto electronics and Materials Science

Moderator(s)
MARIF JAFAROV, NAGIF NABIYEV

10:00−10:15 MIRZOAZIZ KHUSENOV, DILSHOD NEMATOV, AMONDULLO BURHONZODA, KHOLMIRZO KHOLMURODOV
MOLECULAR DYNAMICS NANOSCALE PHENOMENA: COMPUTER DESIGN FOR NEW DRUGS AND MATERIALS

10:15−10:30 E.A. SALAKHOVA, D.B. TAGIYEV, M.A. RAMAZANOV,Z.A. AGHAMALIYEV, K.F. IBRAGIMOVA, P.E. KALANTAROVA
ELECTROCHEMİCAL OBTAİNİNG OF SELENİUM-CONTAİNİNG RHENİUM CLUSTERS

10:30−10:45 S. MAMMADOVA, N. LYADOV, A. ISRAFILOV, S. ABDULLAYEVA, A. HUSEYNOV
SYNTHESIS OF MWCNTs FROM MIXTURE OF XYLENE BY A-CVD METHOD

10:45−11:00 M.A. RAMAZANOV, H.S. IBRAHIMOVA, F.V. HAJIYEVA
INFLUENCE OF ELECTROTHERMOPOLIZATION CONDITIONS ON STRENGTH AND ELECTRET PROPERTIES OF PP +ZrO_2 NANOCOMPOSITIONS

11:00−11:15 Z.A. AGHAMALIYEV, G.KH. AZHDAROV
MODIFIED ZONE MELTING METHOD: MODELLING OF COMPONENTS CONCENTRATION DISTRIBUTION IN Ge-Si SINGLE CRYSTALS

11:15−11:30 I.M. NURUYEV, A.M. MAHARRAMOV, R.N. MEHDIYEVA, M.A. NURIYEV
THE STRUCTURAL FEATURES OF P(VDF-TeFE)/Si COMPOSITES MODIFIED BY GAMMA-RAYS

11:30−11:45 A.G. KAZIM-ZADA, V.M. SALMANOV, A.G. GUSEYNOV, R.M. MAMMADOV, A.A. SALMANOVA, N.D. DASHDAMIROVA
PHOTOVOLTAIC PROPERTIES OF In_2O_3-InSe-Pt SYSTEM

11:45−12:00 M.M. TAGHIYEV, G.D. ABDINOVA
ELECTRICAL AND HEAT PROPERTIES OF BULK NANOSTRUCTURED SAMPLES OF $Bi_{85}Sb_{15}$ SOLID SOLUTION

12:00−12:15 ***Cofee Break***

12:15−12:30 N.A. ABDULLAEV, KH.K. SHIRALIYEVA
CONFOCAL RAMAN MAPPING OF $CdGa_2S_4$ AND $ZnGa_2S_4$CRYSTALS

12:30−12:45 SH.I.ISMAYILOV, N.M.ABDULLAYEV, V.A.ABDURAHMANOVA
THERMAL CONDUCTIVITY OF $Sm_xSn_{1-x}Se$ CRYSTALS AND MOBILITY OF CARRIERS

12:45−13:00 SH.G. ASGAROV, L.K. ABDULLAYEVA, L.F. AGHAMALIEVA
INVESTIGATION OF THE MECHANISM OF BREAKDOWN OF SCHOTTKY DIODES DEPENDING ON THE METAL MICROSTRUCTURE

13:00−14:00 Lunch

14:00−14:15 T.D. IBRAGIMOV, A.R. IMAMALIYEV, G.F. GANIZADE
INFLUENCE OF FULLERENES ON THRESHOLD VOLTAGE, DIELECTRIC AND CONDUCTIVITY PROPERTIES OF SMECTIC A LIQUID CRYSTAL 10NF

14:15−14:30 M.A. JAFAROV, E.F. NASIROV, S.A. JAHANGIROVA, R. MAMMADOV, J.V. JAFAROV
NANOSTRUCTURED POROUS Si-Cu_2ZnSnS_4 THIN FILMS

14:30−14:45 M.A. RAMAZANOV, J.R. SULTANOVA
THE STRUCTURE AND DIELECTRIC PROPERTY STUDIES OF THE NANOCOMPOSITESBASED ON POLY(VINYLENE FLUORIDE) AND IRON NANOPARTICLES

14:45−15:00 S. HASANOVA
SYNTHESIS OF TITANIUM DIOXIDE NANOPARTICLES FOR PHOTOCATALYTIC DEGRADATION OF COD IN WASTEWATER UNDER ULTRAVIOLET IRRADIATION

Friday, May 03, 2019

Parallel Session(s)

Room: The main building of BSU, auditorium 316

Theoretical and Mathematical and High Energy Physics

Moderator(s)
PAVLE ASATIANI, RAUF JAFAROV

10:00−10:15 S.D. DEMUKHAMEDOVA, U.A. HASANOV, I.N. ALIYEVA, Z.O. GAKHRAMANOVA
QUANTUM CHEMICAL STUDY OF THE SPATIAL AND ELECTRONIC STRUCTURE OF A DIAZACROWNETHER WITH H-LYS-LYS-OH DIPEPTIDE FRAGMENT IN THE MACROCYCLIC RING

10:15−10:30 A.G. RZAYEV, G.I. KALBALIYEV, S.R. RASULOV
ABOUT THE STRUCTURE OF ATOMIC NUCLEUS

10:30−10:45 A.L. KOZLOVSKIY, M.V. ZDOROVETS
THE EFFECT OF IRRADIATION WITH Fe^{7+} IONS ON THE STRUCTURAL PROPERTIES OF TiO_2 FOILS

10:45−11:00
S.G.ABDULVAHABOVA,N.SH.BARKHALOVA, T.O.BAYRAMOVA
STUDYING THE E2 TRANSITIONS IN NUCLEI USING THE SUBGROUP SU(5)

11:00−11:15 SH.SH. ALAKBAROV
ENERGY PROCESSES IN THE CASE OF DISTRIBUTION BOLTZMAN IN GRAVITATIONAL FIELD

11:15−11:30 M.M. YUSIFOVA, N.A. SULTANOVA, K.A. HUSEYNOV
SAGROPHYSICAL PROPERTIES OF GRAY-BROWN IRRIGATED SOILS UNDER THE VEGETABLE CROPS OF THE ABSHERON PENINSULA OF THE REPUBLIC OF AZERBAIJAN

11:30−11:45 Z.A. SAMADOV
MICROTURBULENT VELOCITY IN THE ATMOSPHERES OF F SPECTRAL CLASSES STAR

11:45−12:00 Cofee Break

12:00−12:15 Z.A. SAMADOV
INVESTIGATION OF THE ATMOSPHERE OF HR6978 (45Dra, F7Ib) STAR

12:15−12:30 S.K. ABDULLAYEV, M.SH. GOJAYEV
HIGGS BOSON RADIATION IN ELECTRON-POSITRON COLLISIONS

12:30−12:45 A.S. ALIFOV
STABILITY OF THIN PLATES WITH HOLES

12:45−13:00 SH.M. NAGIYEV
CONFIENEMENT MODEL OF THE HARMONIC OSCILLATOR

13:00−13:15 I. BOYKO
STUDY OF HIGGS BOSON PRODUCTION IN ASSOCIATION WITH A SINGLE TOP QUARK pp->tH

13:15−13:30 N. HUSEYNOV
SEARCH FOR THE ASSOCIATED PRODUCTION OF A HIGGS BOSON AND A TOP QUARK PAIR IN MULTILEPTON

13:30−14:30 Lunch

Friday, May 03, 2019

Parallel Session(s)

Room: The main building of BSU, auditorium 125

Theoretical Physics

Moderator(s)
ELDAR ALAKBAROV

10:00−10:10 T.H. ISMAYILOV, A.E. AHAD
ELECTRON GAS IN QUANTUM FILM WITH SPIN-ORBITAL RASHBA INTERACTION

10:10−10:20 SH.A. MAMMADOV, A.H. ASADOV, M.M. MAHMUDOV
NUCLEONS FORM-FACTORS IN ISOSPIN MEDIUM IN THE HOLOGRAPHIC QCD

10:20−10:30 K.M. MIKAYILOVA.Z. BULUDKHANLI
PHOTOMETRIC AND SPECTRAL REDSHIFTS IN THE STAR CH CYGNI

10:30−10:40 E.SH. ALAKBAROV, E.R. ALIZADA
USING INTERACTIVE COMPUTER MODELS IN THE STUDY OF PHYSICS AS A MEANS OF MOTIVATION OF STUDENTS

10:40−10:50 E.S. GARAYEV, N.M. ALVERDIYEVA
ELEMENTS OF PHYSICAL THEORIES IN THE COURSE OF INITIAL PHYSICS

10:50−11:00 R.SH. RAHIMOV, T.A. ASLANOVA
SOME PECULIARITIES OF TEACHING OF THE PHYSICAL LAWS IN PHYSICAL COURSE OF SECONDARY SCHOOL

11:00−11:10 SH.A. MAMMADOV, G.C. SHAHVERDIYEVA
NUCLEON'S AXIAL CHARGE IN HOLOGRAPHIC QCD

11:10−11:20 S.R. FIGAROVA, G.R. ALIYEVA
DEPENDENCE OF THERMODYNAMIC MAGNITUDES ON ASYMMETRICAL QUANTUM WELL PARAMETERS

11:20−11:30 S.G. ABDULVAHABOVA, G.V. GULIYEVA
POLARIZATION THE HADRONS IN NUCLEAR SCATTERING PROCESSES

11:30−11:40 A.K. ORUJOV, G.Y. MANSUROVA
ROLE OF PHYSICS IN ORGANIZATION OF ECOLOGİCAL TRAINING

11:40−12:00 ***Cofee Break***

12:00−12:10 Y.G. NURULLAYEV, T.M. GASIMZADE
DIDACTIC FUNCTION OF PHYSICAL EXPERIMENT IN THE SCHOOL PROGRAM OF PHYSICS

12:10−12:20 F.H. PASHAYEV, A.G. HASANOV, F.K. GULIYEVA
CALCULATION OF KINETIC ENERGIES OF THE ELECTRONS AND POTENTIAL ENERGY OF THE ATOMS WITH OPEN ELECTRONIC SHELLS ON THE BASE OF SLATER-TYPE ATOMIC ORBITALS

12:20−12:30 S.A. MAMMADOV, H.M. MAMMADLI
COUPLING CONSTANT OF OCTET BARYONS WITH THE VECTOR MESON FROM THE HARDWALL Ads/QCD MODEL

12:30−12:40 S.G. ABDULLAYEV, H.Z. GULUZADA
HIGGS DECAY INTO h AND z BOSONS

12:40−12:50 A.K. ORUJOV, U.R. HUSEYNLI
TEACHING METHOD OF DISCRETENESS OF THE ELECTRIC CHARGE

12:50−13:00 N.S. NABIYEV, S.M. ISRAFILOVA
SPATIAL STRUCTURE AND STABILIZATION CHARACTERISTICS OF METAL ION AND WATER MOLECULES (Semiemprical electrostatic model).

13:00−14:00 ***Lunch***

14:00−14:10 I.R. GADIROVA, K.N. NAJAFOVA
INTERBAND LIGHT ABSORPTION IN SEMICONDUCTOR QUANTUM WELL

14:10−14:20 M.M. MAHMUDOV, KH.S. SALAHLI
ELECTRICAL CONDUCTIVITY IN SUPERLATTICES IN A QUANTIZED MAGNETIC FIELD AT A SCATTERING OF CHARGE CARRIERS BY IMPURITY IONS

14:20−14:30 A.K.ORUJOV, L.G. AMIRALIYEVA
TEACHING METHODOLOGY OF POLYTECHNIC TRAINING IN ACCORDANCE WITH SOCIETY'S REQUIREMENTS

14:30−14:40 N.A. RAHIMOVA, L.V. GULIYEVA
EXCITONS IN ABSORPTION AND PHOTOCONDUCTIVITY OF SINGLE CRYSTAL OF $TlGaSe_2$

14:40−14:50 J.N. RUSTAMOV, L.V. AHMADLI
LINE H_α IN THE SPECTRUM OF A STARHD 206267

14:50−15:00 V.V. DADASHOVA, İ.V. MUTALLIBOVA
SCIENTIFIC-METHODOLOGICAL ANALYSIS OF MOLECULAR PHYSICS IN MODERN SCHOOL PHYSICS

15:00−15:10 S.G. ABDULLAYEV, N.A. ALIZADA
HİGGS DECAY İNTO h- AND W-BOSONS

15:10−15:20 S.R. FIGAROVA, N.A. NAZARLI
TRANSVERSE NERNST-ETTINGSHAUSEN EFFECT OF QUANTUM FILM IN QUANTIZED MAGNETIC FIELD

15:20−15:30 T.H. ISMAYILOV, N. S. EYVAZOVA
FARADAY ROTATION IN SEMICONDUCTOR QUANTUM FILM

15:30−15:40 Z.A. SAMADOV, P.A. MAMMADLI
DETERMINATION OF ELEMENT ABUNDANCE OF THE STAR HD203574 (G5III)

15:40−15:50 T.H. ISMAYILOV, G. N. GASIMOVA
FARADAY ROTATION IN SEMICONDUCTOR QUANTUM WIRE

15:50−16:00 F.H. PASHAYEV, A.G. HASANOV, S.G. RAHIMZADA
DETERMİNATİON OF POTENTİAL PARAMETERS OF BeH AND CH MOLECULES

16:00−16:10 Z.F. ALIYEVA, N.I. RZAYEVA
CHANGES OF WIDES OF CORONAL LINES

16:10−16:20 T.H. ISMAYILOV, S.I. ZEYNALOVA
ELECTRONIC RAMAN SCATTERING FROM SURFACE OF SEMICONDUCTOR NANOTUBE

16:20−16:30 S.R. FIGAROVA, S.K. ALIAHMADLI
FIELD DEPENDENCE OF NERNST-ETTINGSHAUSEN TRANSVERSE EFFECT IN SUPERLATTICES FOR ACOUSTIC PHONON SCATTERING

16:30−16:40 A.S. GULIYEV, S.N. BAGHIROVA
SPECTROPHOTOMETRIC CHARACTERISTICS OF FRAUNHOFER LINES IN THE SPECTRUM TOTAL FLUX FROM THE WHOLE SOLAR DISK

16:40−16:50 M.M. MAHMUDOV, S.N. PANAHOV
CALCULATIONS OF SOME THERMODYNAMIC MAGNITUDES IN SIZE-QUANTIZED DILUTED MAGNETIC SEMICONDUCTOR FILM

16:50−17:00 K.I. ALISHEVA, N.M. MAMMADOVA
HI AND HII REGIONS IN PLANETARY NEBULAE

17:00−17:10 A.I. AHMADOV, R.A. ZEYNALABDINLI, E.A. DADASHOV
HIGHER TWIST EFFECTS IN PHOTON-PHOTON COLLISION

17:10−17:20 A.I. AHMADOV, R.A. ZEYNALABDINLI
THE INCLUSIVE PRODUCTION OF PION IN ELECTRON-POSITRON COLLISIONS

17:20−17:30 SH.V.SHUKURLU, N.M.NASRULLAYEV
WRITING ASSESSMENT CRITERIA

17:30−17:40 M.R. RAJABOV, Z.I. HASHIMLI
EVOLUTION OF POLARIZED ELECTRON-PHOTON SHOWER IN CRYSTALS WITH VARIUS INITIAL CONDITIONS

17:40−17:50 L.A. AGHAMALIYEVA, G.A. MAMMADLI
CURRENT STATE IN REGGE'S THEORY

Friday, May 03, 2019

Parallel Session(s)

Room: The main building of BSU, auditorium 335

Applied Physics

Moderator(s)
ARIF ORUJOV

10:00−10:10 H.B. IBRAHIMOV, L.A. EYVAZOVA
ABSORPTION OF LIGHT BY FREE CHARGE CARRIERS WITH THE PARTICIPATION OF PHONONS IN A QUANTUM WIRE

10:10−10:20 G.I. GARIBOV, M.R. HAJIYEVA
INVESTIGATION OF STRATS IN ARGONE GAS

10:20−10:30 G.J. ABBASOVA, N.H. HASHIMOVA
SPATIAL STRUCTURAL ORGANIZATION OF THETYR-ALA-GLY-ALA-VAL-VAL-ASN-ASP-LEU MOLECULE

10:30−10:40 N.F. GAHRAMANOV, İ.E. VAHABLI
PREPARATION OF GRADED DISTRIBUTION OF COMPOSITION THROUGHOUT THE BINARY SOLID SOLUTION MONOCRYSTALS

10:40−10:50 L.H. HASANOVA, T.E. MAHAMMADLI
FEATURES OF PHOTOCONDUCTIVITY IN $Cu_3In_5S_9$ SINGLE CRYSTALS

10:50−11:00 H.M. MAMMADOV, S.A. JAFAROV
ELECTRICAL AND PHOTOELECTRICAL PROPERTIES OF HETEROJUNCTIONS p-Si/$Cd_{1-x}Zn_xO$

11:00−11:10 S.B. ORUJOVA, SH.SH. ALAKBAROV
ELECTROPHYSICAL PROPERTIES OF COMPOSITE MATERIAL OF POLYSTYRENE + Al_2O_3 RADIATED BY UV

11:10−11:20 B.B. DAVUDOV, S.A. ABDURAHMANOVA
IMPULSE PLASMA TECHNOLOGY IN THE GROWTH OF THIN FILM MATERIALS OF SILLENITE STRUCTERED COMPOUNDS

11:20−11:30 M.A. JAFAROV, A.SH. ASGAROVA
PHOTOELECTRIC PROPERTIESZnS:Co (Cr) THIN FILMS

11:30−11:40 G.M. MEMMADLI, M.B. MURADOV
EFFECT OF ELECTROLYTE CONCENTRATION ON THE OPTICAL PROPERTIES OF CdS NPs

11:40−12:00 ***Cofee Break***

12:00−12:10 G.A. BABAYEVA, B.B. DAVUDOV
EROSION OF THE ANOD SURFACE IN PULSE PLASMA EVAPORATOR

12:10−12:20 M.N. AGAYEV, G.A. MURADOVA
DYNAMICS OF DISCHARGE DEVELOPMENT IN LONG TUBE WITH VARIABLE DISTRIBUTED CAPACITY

12:20−12:30 I.M. AFANDIYEVA, H.G. SOLTANOVA
INFLUENCE OF HEAT TREATMENT ON CHARACTERISTICS OF Al/N-Si SCHOTTKY DIODES

12:30−12:40 A.H. KAZIM-ZADA, I.T. MAMMADOVA
ABSORPTION AND LUMINESCENCE OF GALLIUM SELENIDE UNDER THE ACTION OF LASER RADIATION

12:40−12:50 V.M.SALMANOV, L.R. AHMEDZADA
INFLUENCE OF THE INTENSITY OF LASER RADIATION ON THE EDGE OF THE ABSORPTION BAND GALLIUM SELENIDE

12:50−13:00 M.A. JAFAROV, M.H. HASANOVA
ELECTRONIC AND OPTICAL PROPERTIES OF ZnSSe (Mn) NANOCRYSTALS

13:00−14:00 Lunch

14:00−14:10 A.G. HUSEYNOV, G.G. NASIROV
OBTAINING PHOTOSENSITIVE THIN FILMS OF COMPOUND $AgIn_5Se_8$

14:10−14:20 P.M. ZEYNALLI, E.M. HUSEYNOV
RADIATION DEFECTS INVESTIGATION OF NANO SILICA (SiO_2) PARTICLES USING EPR METHOD

14:20−14:30 S.A.JAHANGIROVA, SH.SH.ALIYEVA
CdS/Cu_2ZnSnS_4 STRUCTURE FOR SOLAR CELLS

14:30−14:40 N.F. GAHRAMANOV, S.P. ALAKBAROVA
ELIMINATE SOME DIFFICULTIES WHILE OBTAINING Ge-Si BINAR SOLID SOLUTION MONOCRSTALS

14:40−14:50 A.H. HUSEYNOVA, F.V. HAJIYEVA
DIELECTRIC PROPERTIES OF NANOCOMPOSITES ON THE BASE OF POLYVINYLCHLORIDE (PVC) AND MAGNETITE NANOPARTICLES (Fe_3O_4).

14:50−15:00 F.V. HAJIYEVA, A.H. HUSEYNOVA
THERMAL PROPERTIES OF MAGNETIC POLYMER NANOCOMPOSITES BASED ON PVC+Fe_3O_4

15:00−15:10 A.G. HUSEYNOV, R.E. TAGHIYEVA
THE IMPURITY STATE OF PROPER DEFECTS IN $Ag_3In_5Se_9$

15:10−15:20 D.N. PIRIYEVA
TOWARD REDUSE OF THE LANDAU GHOST POLE IN QUANTUM THEORY

15:20−15:30 A.Z. ABASOVA, S.M. MEHDIYEVA
ELECTRICAL CONDUCTIVITY OF $CuInS_2$ CRYSTALIRRADIATED BY THE γ-QUANTUMS

15:30−15:40 H.B. IBRAHIMOV, F.V. SAFARLI
LUMINESCENCE PROPERTIES OF CdS:Cu (Mn) NANOPARTICLES

Plenary Session

ATOMIC-SCALE IMAGING OF HYDRATED WATER MOLECULES AT A SOLID-LIQUID INTERFACE BY ATOMIC FORCE MICROSCOPY

N. Kobayashi
Graduate School of Science and Engineering, Saitama University, Japan
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Hydration structures play important roles in various phenomena at solid-liquid interfaces. Recently, frequency modulation atomic force microscopy (FM-AFM) has enabled us to visualize individual hydrated water molecules constituting hydration structure. In this study, we have investigated hydration structures formed on polymorphic acetaminophen crystals by FM-AFM. We revealed that a rigid and multilayered hydration structure is formed on the stable crystal compared with that formed on the metastable crystal. This is most likely related to the lower solubility of the stable crystal than that of the metastable crystal.

DISTINCTIVE FEATURES OF EMISSION SPECTRA OF CRUDE OILS OF THE ABSHERON PENINSULA

[1]A.M.Pashayev, [1]A.A.Musayev, [1]B.G.Tagiyev, [2]N.A.Veliyev, [1]Y.M.Baghirov, [1]K.R. Allahverdiyev, [1]I.Z. Sadikhov
[1] Azerbaijan National Aviation Academy, Azerbaijan
[2] State Oil Company of Azerbaijan Republic
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KA-14 LIDAR, have been developed at the National Aviation Academy of Azerbaijan [1]. KA-14 LIDAR was used for detection of fluorescence spectra of crude oil spills on the surface of the Caspian sea as well as on the earth surface of the Absheron peninsula. It is well known, that oil spills may take place due to leakage of oil from different Oil-Gas-Production Companies (OGPC) of the State Oil Company of Azerbaijan Republic (SOCAR). There are 12 OGPC in Azerbaijan. Among them there are: 8 SOCAR Companies and 4 Joint Ventures)).

Emission spectra of oils were excited by 355 nm line of CRF 200-type laser (QUANTEL) (diameter of laser beam spot $\varnothing$ = 5 mm (after collimation- 40 mm); frequency of excitation f = 20 Hz; pulse duration and power of laser: τ = 7 ns and 60 mJ, respectively)).

Analysis of distinctive features of the spectral (positions of maximums of fluorescence; forms and fine structures of spectra) allowed with a high degree of availability to determine from which OGPC of SOCAR (including OGPC “NeftjanijeKamni”) leakage took place on the surface of the Caspian sea and on the earth of the Absheron peninsula.

Results obtained seems to be useful for creation of a data bank of fluorescence spectra of crude oil extracted on the earth of the Absheron peninsula of Azerbaijan as well as from adjacent water areas of the Caspian sea.

The authors are thankful to the State Oil Company of Azerbaijan Republic for financial support.

[1] A.M. Pashayev, K.R. Allahverdiyev, B.G. Tagiyev, I.A. Sadikhov, "Light induced fluorescence
LIDAR developed and employed at the National Aviation Academy of Azerbaijan", Proc. of SPIE,
Vol. 10226, pp. 102260W-1 – 102260W-6, (2017).

CIRCULATION PHYSICAL FUNDAMENTALS OF COMPUTING AND TECHNOLOGIES

P. Asatiani
Georgian Technical University, Georgia

Using the circulation as fundamentals of universal language we have transferred the circulation in the machine language of information technology too. Following our MOS field transistors with circulation ring geometry last investigations in nanotechnology show for today the revealed opportunity for construction of the spin transport and Internet machine on the basis of circulation taking into account that the spin itself is the derivative of the circulation. We have got for today the model of machine with universal computing language including neurocomputing, on the basis of circulation, which communicate two natures micro- and macrocosmos, its ideal (superfluid) and normal components in the two-fluid model of superfluids, uniting cognizable and incognizable parts of our Universe with the feedback.

LOW TEMPERATURE THERMOLUMINESCENCEC STUDYING Y_2O_3 NANOPARTICLES

N. Hasanli
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Virtual International Scientific Research Centre, Baku State University, Azerbaijan
nizami@metu.edu.tr

Rare earth oxides are famous materials attracted much attention due to their unique physical and chemical properties. These may be applicable for optoelectronics, luminescent and biomedical devices. Y_2O_3 is a rare earth material becoming focus of interest in many research fields. The material can be used for LEDs and MOS transistor applications.

In this study, luminescence centers in Y_2O_3 nanoparticles were explored using thermoluminescence (TL) measurements in the below room temperature region. TL spectrum obtained at constant heating rate of 0.4 K/s presented overlapped seven peaks around 19, 62, 91, 115, 162, 196 and 215 K. $T_{max}-T_{stop}$experimental method was used to determine the number of peaks consisting in whole TL curve and characteristics of trapping centers associated with these peaks. Analyses of TL curves obtained at different stopping temperatures resulted in presence of one quasi-continuously distributed trap within the forbidden gap and six discrete single trapping centers. Activation energies of traps responsible for observed peaks were revealed using initial rise method for TL curves obtained with various T_{stop}values. Activation energy of distributed trap centers was found as increasing from 18 to 24 meV as a function of T_{stop} in the range of 10–16 K. Activation energies of six single trap centers were determined as 49, 117, 315, 409, 651 and 740 meV. Heating rate dependence of TL curves was also studied with the different ranges between 0.4 and 0.8 K/s. The increase of heating rate leads to decrease of TL intensities and increase of peaks maximum temperatures. The decrease of TL intensity with heating rate is the evidence of thermal quenching effect.

STUDIES OF THE COMPARATIVELY LOW-TEMPERATURE SYNTHESIS AND PRELIMINARY TOXIC CHARACTERISTICS OF SILVER DOPED LANTHANUM MANGANITE NANOPARTICLES USING CONVENIENT AND MICROWAVE HEATING

[1]A. Chirakadze, [1]D.Jishiasgvili, [2]N.Mitagvaria, [2]I.Lazrishvili, [1]Z.Shiolashvili, [1,2]A.Jishiasgvili, [1]N.Makhatadze, [1]Z.Buachidze, [1]N.Khuskivade
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The research is dedicated to microwave and conventional methods of solution combustion synthesis of the comparatively new nanomaterial proposed for magnetic hyperthermia of cancer cells and preliminary assessment of the toxicity of developed materials based the behavioral methods and technics, at the levels far below of commonly registered by means of usualy and widely applied assays for humans but father research is needed to optimize the methods of materials with required characteristics.

INFLUENCE of THERMAL FLUCTUATIONS on CRITICAL CURRENT of JOSEPHSON JUNCTION WITH UNCONVENTIONAL CURRENT-PHASE RELATION

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In this study we carried out the analysis of the thermal fluctuations of Josephson junction (JJ) with unconventional current-phase relation (CPR). It was obtained expression for the critical current fluctuations in case of linear growing of current via junction in limits of low sampling rate. It is shown that, the dynamical properties of JJ with unconventional CPR is determined by the renormalized critical current of JJ.

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DEVELOPMENT OF LASER PHYSICS

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Lasers along with atomic energy and a computer are called one of the three most outstanding technical achievements of the 20th century. No wonder sometimes lasers are called "Locomotive of the XXI-century". A major contribution to the development of the issue of laser radiation was made by A. Einstein's hypothesis about stimulated emission. The world's first laser was created in 1960 by the American physicist T. Meiman. In its creation, all the basic ideas of quantum

electricians, expressed by this time by N. G. Basov, A. M. Prokhorov and C. Townes, i.e. the need for the inverse population of the levels of the active medium, the method of three levels with external pumping, the use of open resonators to enhance the effect of stimulated radiation and obtaining a positive feedback. The stages of development of laser physics, starting with free generation, including Q-switched lasers, nano-pico and femtosecond lasers, are considered. It is shown that the method of generating high-intensity ultrashort optical pulses invented by Gerard Mourou and Donna Strickland revolutionized laser physics. Ultrashort and intense laser pulses can be used in eye surgery, for storing data and making medical stents for operations in body vessels, etc. Arthur Ashkin's optical tweezers allow you to capture particles, atoms, and molecules with the fingers of a laser beam. Viruses, bacteria and other living cells can be retained, examined and manipulated without being damaged.

POLARIZED ELECTRON TARGETS AS UNIQUE TOOL FOR THE DISTINGUISHING OF THE FLAVOUR COMPOSITION OF THE NEUTRINO (ANTINEUTRINO) BEAM

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The calculations and analyses of the differential cross section of the scattering of the neutrino (antineutrino) beam at the polarized electron targets show that the differential cross section is sensitive to the neutrino (antineutrino) flavour. It enables experimentators to use polarized electron targets for detection of neutrinos (antineutrinos) and for the distinguishing of the flavour composition of the neutrino (antineutrino) beam.

DESIGN AND DEVELOPMENT OF HEUSLER ALLOYS FOR MAGNETIC REFRIGERATION APPLICATIONS

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Cooling systems are used in houses, cars, hospitals, defence systems and many other such areas. However, the gases (chlorofluorocarbons and hydrochlorofluorocarbons) present in today's refrigerant systems are harmful to the environment and cause global warming. Moreover, today's cooling technology is expensive and low-efficiency technology. Therefore, new and cost-effective with higher energy efficiencies cooling systems have begun to be developed to eliminate the use of these harmful gases. Among them, magnetic refrigeration has attracted increasing interest in the materials research communities because of its higher cooling efficiency and environmentally friendliness. Full Heusler alloys are magnetic ternary intermetallic compounds with the $L2_1$-type crystal structure. Typically, these alloys undergo a low temperature martensitic transformation (austenite↔martensite), a magnetic transformation (ferromagnetic↔paramagnetic) and relatively high temperature atomic ordering (order↔order and order↔disorder) transformations. After the discovery of the ferromagnetic shape memory (FSM) and giant magnetocaloric effects (GMCE) in Ni-Mn-Ga alloy, Ni-Mn based Heusler alloys have received considerable attention due to their unique magnetic and structural properties. The presentation will be an overview of the main research thrusts at the “Novel Alloys Design and Development Lab” (NOVALAB) of MetE-METU in the designing and development of advanced metallic materials for magnetic refrigeration applications.

Nano, -opto electronics and Materials Science

DEPENDENCE OF PHOTOCONDUCTIVITY ON THE ELECTRICAL FIELD IN n-InSe

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Effect of electric field with intensity of up to 2.5×10^3 V/cm on the spectral distribution and light characteristic of photoconductivity in n-InSe crystals were studied at temperatures of 77–350 K. It has been established that the resistivity of different samples differs in low-temperature region ($T\leq250K$) and nature of effect of the electric field on the photoconductivity besides the electric field intensity also depends on the resistivity of the studied samples. Photoelectric characteristics do not depend on the electric field effect in samples with low resistivity at the considered values of the electric field intensity. Dependence of spectral distribution and light characteristics of photoconductivity on the applied electric field is observed in samples, with increasing the samples resistivity at voltages, exceeding the voltage of producing noticeable injection. This dependence becomes stronger with increasing the sample resistivity, and decreases with increasing temperature. The light characteristics have superliner character at low illumination of crystals with high resistance and exponent of the photocurrent-light intensity dependence increases with increasing sample resistivity, and decreases with increasing temperature and electric field intensity becoming unity. Photoconductivity spectrum shifts towards longer wavelengths under low illumination and electric fields with increasing resistivity of samples. This shift gradually disappears with increasing temperature and electric field intensity. It is shown that the observed dependence of photoconductivity

characteristics in n-InSe single crystals on the electric field in low-temperature region are due to the spatial nonhomogeneity of studied crystals and electrical rectification of the potential relief of energy bands in them.

INFLUENCE OF EXTERNAL AND INTRACRYSTALLINE FACTORS ON THE MOBILITY OF CHARGE MEDIA IN n-InSe SINGLE CRYSTALS

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The temperature dependence of the charge carrier mobility (μ) in undoped and doped with rare-earth elements (gadolinium and erbium) n-InSe single crystals is studied. It has been established that in the region of low temperatures (at T<300K) the magnitude of the mobility of charge carriers for different samples differs significantly. With increasing initial resistivity, the magnitude of this discrepancy increases, and with increasing temperature it decreases. In this case, the dependence of mobility on temperature obeys the law $\mu \sim e^{-\frac{\Delta\varepsilon}{kT}}$. This behavior of the μ(T) dependence is not explained by the theory of charge carrier mobility in spatially homogeneous crystalline semiconductors.

In the low-temperature region, dependences of the mobility of charge carriers on the resistivity and the content of the introduced impurity, which are not characteristic of spatially homogeneous crystalline semiconductors, are also characteristic.

In the high-temperature region, the dependence of μ(T) obeys the theory for spatially homogeneous crystalline semiconductors, with charge carriers scattering on acoustic lattice oscillations dominating ($\mu \sim T^{-\frac{3}{2}}$).The mobility of charge carriers does not depend on the chemical

nature of the impurity introduced; it only varies nonmonotonically depending on its content.

In the studied crystals, the mobility of charge carriers also depends on the electric field intensity (E).

However, in this case, the noticeable dependence μ (E) begins at significantly low values of the electric field strength and differs significantly from the dependence μ (E), which occurs when the charge carriers in the semiconductors are heated by the electric field.

It is shown that the results obtained are primarily related to the presence of drift barriers in the energy zones of n-InSe crystals, whose energy height at 77 K for various samples is ~ (0.05 ÷ 0.20) eV.

With increasing temperature, as well as the electric field strength, at which significant injection takes place, the corresponding smoothing (temperature or electric, respectively) of these barriers occurs. As a result, the value of carrier mobility increases. As for the nature of these potential barriers, they are primarily due to the layering of the investigated crystals.

THERMAL CONDUCTIVITY IN $TlIn_{1-X}YB_XSe_2$ SOLID SOLUTIONS

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In recent years, due to its fascinating properties, compound compounds and loose solid solutions, including rare earth elements - lantanoids, attract the attention of researchers. These materials are usually controlled by high melting temperatures, maintaining their own semiconductor properties in a wide temperature range, great mechanical strength, stability of the characteristic semiconductor parameters and their composition change, and so on. They have different features.

One of these objects is $TlIn_{1-x}Yb_xSe_2$ solid solutions present in the *$TlInSe_2$*-$TlYbSe_2$ limited solution zone. As is known, $TlInSe_2$ is a triangle with tallium atoms +1, and indium atoms are +3.The ion radii

of the triangular indium atoms are close to the radius of the triangular isotropic ions, and in this respect, the triangular indium ions in the *TlInSe₂* combination are gradually replaced by triangular itterbium ions, and as a result $Tl^{+1}In^{+3}Se_2^{+2} \rightarrow Tl^{+1}In_{1-x}^{+3}Yb_x^{+3}Se_2^{-2}$ solid solutions are formed on the $TlInSe_2$-$TlYbSe_2$ system in the $TlInSe_2$ merger. Surveys show that the present system exists in the solution zone and covers 0 ÷11 mol% $TlInSe_2$ at room temperature.Solid solutions of all $TlIn_{1-x}Yb_xSe_2$crystallized into tetrachronic singanon as the initial $TlInSe_2$compounds, and their melting temperature increases as the relative amount of itterbium in the composition increases.

Investigation of "electrical properties" shows that all solids are semiconductors with p-type conductivity, which have the character of memory converter.

Investigation of the "composition- heat properties" diagram allows for the identification of additional heat transfer and scattering mechanisms and other features that can not be observed in these materials in the initial components. In this regard, the investigation of thermal conductivity in solid solutions observed in $TlInSe_2$-$TlYbSe_2$ is of great interest.

As a result of the investigations, thermal conductivity is found in $TlIn_{1-x}Yb_xSe_2$ solid solutions and the thermal conductivity decreases as the amount of itterbium increases in the sample

ELECTRIC CHARGE AND HEAT TRANSFER IN SnTe CRYSTALS WITH DIFFERENT VACANCY CONCENTRATIONS IN TIN SUBLATTICE

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Tin telluride has a complex valence band, crystallizes with a deviation from stoichiometry, and its samples contain electrically active vacancies in the tin sublattice with a concentration of up to 10^{20} -10^{21}

cm^{-3}. This leads to a number of features in the transport properties of this compound, the mechanisms of which are not fully understood, and which limits the use of this promising material for electronic engineering and its solid solutions.

Single crystals of SnTe with super-stoichiometric tin up to 1.0 at.% were obtained, their electrical conductivity σ, thermo-e.m.f. coefficients α and thermal conductivity χ in the range of 90-300 K were studied.

The synthesis and growth of SnTe single crystals with different concentrations of super-stoichiometric tin was carried out using the methods described elsewhere. Samples in the form of cylinders with a diameter of 13-14 mm and a height of ~ 10 mmwere cut from the grown single-crystaline ingots. The disturbed layer formed at the ends of the samples during cutting was removed by electrochemical etching. Samples after their manufacture were annealed in pure argon at 475 K for 120 hours. The thermal conductivity of the samples was measured by the absolute stationary method, and the electrical parameters at direct current by the probe method along the ingot. The error in measuring thermal conductivity and electrical parameters over the entire temperature range did not exceed 5%.

Electronic χ_e and lattice χ_l parts of thermal conductivity, thermal resistances created by structural defects (mainly by vacancies in the tin sub-lattice).

In the region of impurity conductivity, in the case where the semiconductor is opaque in the infrared region, its thermal conductivity can be expressed as

$$\chi = \chi_p + \chi_э \quad (1), \qquad \text{for metals} \qquad \chi_e = L_o \sigma T \quad (2)$$

where L_o is the Lorentz number. For semiconductors with a parabolic zone in the case of arbitrary degeneration and elastic scattering of carriers

$$L = A\,(k/e)^2 \qquad \text{and} \qquad \chi_e = A(k/e)^2 \sigma T$$

where k is the Boltzmann constant, e is the electronic charge, and A is a parameter depending on the scattering parameter. The value of A at different temperatures was determined from the measured experimental

values of the coefficient of thermo-emf. (α) samples along the curve $A=f(\alpha)$.

When extrapolating the linear dependence of W_l on T in the low-temperature region, the segment of thermal resistance at T = 0 K is cut off, the segment is equal to the thermal resistance created by defects in the studied crystals.

It is shown that the dependences of σ и α of samples on temperature are satisfactorily explained by the model of two valence bands of SnTe and thermal conductivity by phonon-phonon scattering. Excess Sn atoms up to 0.05 at.% being distributed over the crystal create donor centers that scatter phonons and compensate for doubly charged vacancies in the tin sub-lattice, which leads to a decrease in χ_l, χ_e, and σ. Above 0.05 at.% excess atoms filling the indicated vacancies and creating additional impurity centers increase χ_l, χ_e, σ.

SUPERSTRUCTURE FORMATION IN $TlIn_{1-x}Sn_xS_2$ EPITAXIAL FILMS

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It's well known that new semiconducting materials with controlled physical properties and high mobility of charge carries are needed for creating new devices. Semiconducting materials of $A^{III}B^{III}C_2^{VI}$ group ternary compounds used as photosensors and detectors of optical radiation are described in particular papers. In most compounds of above-mentioned group the certain part of cation sites are racaut. It is possible to achieve a rather high concentration of free charge carries by adding of impurity content from IV group of periodic to semiconductor compounds of $TlInS_2$.In this paper we investigate the influence of Sn impurity on $TlInSn_2$ epitaxial film structure deposited by the method of thermal evaporation in vacuum $3x10^{-5}$ Pa on NaCl, KCl, KJ celluloid and single crystal substrates. Deposited films are kept

in carbon capsule 2-3 nm in thickness to avoid oxidation and evaporation by thermal treatment. Distribution of condensate composition in coordinates on the condensation plane has been determined by the familiar formula in crystallography:

$$q=\frac{Q}{4\pi h^2}\frac{1}{(1+\alpha)^{3/2}}$$

The possibilities of existing phase transitions from one modification into another and forming superstructures proportional to one or another phase have been investigated by the method of high energy electron diffraction and by installing the electron diffraction line intensity record.

The investigated films of $TlIn_{1-x}Sn_xS_2$ ($x=0.02 \div 0.09$) deposited on the substrates at T~215K are in amorphous and have uniform fine-grained structure of 3.5-4.0 nm grains in size. Two diffuse maxima with values (determined from equation of $S=4\pi\sin\theta/\lambda$, where λ is the electron wavelength, θ is the Bragg angle) of 27.34; 38.26 nm^{-1} have been recorded on electron diffraction pattern of $TlIn_{1-x}Sn_xS_2$ amorphous film. To keep amorphous films in vacuum 10^{-2} Pa at room temperature for 3 months causes the drop in crystallization temperature by ~20K.

Thermal treatment of amorphous films of 30 nm in thickness at T~338 K for 20 minutes with the subsequent cooling down to room temperature in vacuum at the rate 5 K/min results in the formation of $TlIn_{0.93}Sn_{0.07}S_2$ crystalline solid solution with the parameters of tetragonal syngony unit cells increased up to 5%. While continuing the film thermal treatment including disoriented small crystals at T=488K for 30 minutes we observe the phase transition with the formation of perfect texture film. By substance deposition on KJ substrates heated up to 468 K the film epitaxial growth is noted. After thermal treatment of the obtained epitaxial films on KJ substrates at T=508 K for 10 minutes with the subsequent cooling down to room temperature with rate 21 K/min there have been occurred the formation of $TlIn_{0.93}Sn_{0.07}S_2$ super structural phase films with lattice periods being triple with respect to initial phase: $a\approx 3a_0=2.197$ nm ; $c\approx 3c_0=7.618$ nm. By the law of reflex extinction the electron diffraction patterns derived from $TlIn_{1-}$

$_xSn_xS_2$ super structural single crystal films are indexed in tetragonal syngony with space group I 14 mcm. Temperature rise of the substrate up to 490 K and decrease of condensate deposition rate down to the minimum leads to the increase of epitaxial film structure perfection. The unit cells of super structural phase have been aligned with 3 cells of KJ substrate.

Discrepancies between aligned grids of substrate-film lattices are ~3.5%. Orientation ratios at epitaxial growth of films under investigation can be expressed as follows: (100) $TlIn_{1-x}Sn_xS_2$ // (001) KJ.

We note that the possible deviations of $TInS_2$ composition from stoichiometry, the significant impurity concentration, the tendency to oxidation and all kinds of lattice structure violations as well as the polytypeness are due to the difficulties to interpret results. The analysis of obtained data shows that the interaction of ternary compound with the impurity atoms Sn brings about the formation of solid solutions of substitution and superstructure formation. Solid solutions can be formed by both direct exchange atoms in places and their movement through vacancies of crystal lattice with close packing. Based on the ideas presented in we assume that Sn atoms are arranged in crystal lattice sites.

THE ROLE OF EXCITONS IN THE FORMATION OF A PHOTOCURRENT IN A $TlGaSe_2$ SINGLE CRYSTAL

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Of fundamental theoretical and practical interest is the question of the participation of excitons in photoelectric processes. Being an electrically neutral formation, excitons do not transfer charge. However, their interaction with other quasiparticles, electric fields, crystal defects, impurity centers can lead to the appearance of free

current carriers.

The paper presents data on the exciton states in the process of photocurrent formation in $TlGaSe_2$.

In the photoconductivity spectra of $TlGaSe_2$, sharp structures are observed at the edge and in the depth of intrinsic absorption: E_{A1}=2.127 eV, E_{A2}=2.212 eV, E_{B1}=2.355 eV and E_{B2}=2.387 eV at 77K. We note that in the absorption spectra at 77K, only two features are observed: near the edge E_A=2.164 eV and in the depth of intrinsic absorption E_B=2.372 eV. A comparison of the spectral curves of the photoresponse and absorption at 77K shows that the maxima of the absorption peaks A and B are at the minimum observed in the photoresponse spectra of two structures: A_1, A_2 and B_1, B_2. This phenomenon is due to the conversion of the exciton absorption peaks to a dip in the photoconductivity spectra due to non-photoactive absorption near the surface in the region of the maxima of the excitonic peaks of the $TlGaSe_2$ single crystal. With a decrease in temperature, a relative increase in the photocurrent occurs in the shortwave part of the spectrum, which is associated with an increase in the exciton mobility and lifetime with a decrease in temperature, and therefore they can escape from the defective surface layer (where they die, mostly non-photoactive) into the interior of the crystal and cause photocurrent as a result of interaction with centers. Naturally, the photocurrent output in the exciton line in the depth of its own absorption will also increase.

Studies of the dependence of the photocurrent on temperature showed that it is non-monotonic with discontinuous features. The nonmonotonic temperature dependence of the photocurrent is explained by the presence of recombination levels (r and s-centers) in the band gap with active interaction with sticking levels. It was also established that the observed abrupt changes in the photocurrent at 105,117 and 210 K are associated with phase transformations in $TlGaSe_2$.

FABRICATION OF $Cu_{1.75-x}In_xTe$ MONOCRYSTALS AND INVESTIGATION OF STRUCTURE TRANSITION (x= 0.05 at.%).

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In the present paper the influence of isovalent substitution of Cu^{2+} metal ions by the In^{2+} metal ions on the elemental crystal lattice parameters and phase transition temperature have been investigated by the roentgenographic method in $Cu_{1.75}Te$ singlecrystals fabricated by Bridgman method. For determine the monocrystalline and monophasicity of $Cu_{1.75}In_{0.05}Te$ crystals obtained by this method, was carried out lauegram and provided X-ray phase analysis by diffractometer. The parameters of $Cu_{1.75}Te$ crystal structure increases by the substituting of Cu^{2+} metal ions by In^{2+} isovalent metal ions. This increase is related to the difference in the ion radius of the metal ions of In^{2+} -0.92 Å and replaced Cu^{2+} -0.80 Å, in the $Cu_{1.75}Te$ crystal structure.

After X-ray phase analysis, it's obtained that, $Cu_{1.75}In_{0.05}Te$ monocrystalline crystallizes in hexagonal structure with a_o=3.8901 Å, c_{or}=21.7168 Å, F.qr. p6/m2-(D_{3h}^1) parameters.

The hexagonal ↔ cube transition which occurs at 725 ± 1K in $Cu_{1.75}In_{0.05}Te$ monocrystalline is reciprocal and its monocrystalline - monocrystalline type. For high temperature cube phase "a" parameter has been set as a = 6.1053Å. It has been defined that, as In^{2+} metal ions substitute Cu^{2+} ions in the $Cu_{1.75}Te$ crystal structure, the transition temperature slides to the temperature of increase zone.

EFFECT OF TEXTURING REGIMES ON THE EFFICIENCY OFp-Si/TEXTURED-Si/$ZnS_{1-x}Se_x$ HETEROJUNCTIONS SOLAR CELLS

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In this paper the p-Si/textured-Si/$ZnS_{1-x}Se_x$heterojunctionswere fabricated by electrochemical deposition of $ZnS1_{-x}Se_x$ (x = 0; 0.1 and 0.2) films ontothe crystalline p-Si/SK and p-Si/SHsubstrates (SK and SH are textured silicon etched in $KOH+C_3H_8O$ and $HF+HNO_3$, respectively). Photoelectrical properties of heterojunctions were investigated depending on the etching duration, solution temperature and concentration of solids in solutions (KOH and HF (1-5 wt%); C_3H_8O and HNO_3 (3-10 vol%).It has been established that the efficiency of the p-Si/textured-Si/$ZnS_{1-x}Se_x$solar cells depends on the etching regime. The optimal concentration of solids(KOH-3wt% $+C_3H_8O$- 6 vol%; HF-5wt% + HNO_3-8 vol%), solution temperature (80^0C) and etching duration (40 min) were determined for maximum efficiency of solar cells: for p-Si/SK4/ZnS–FF=0.58; η=9.36%; for p-Si/SH4/ZnS-*FF*=0.5; η=7.1%; for p-Si/SK4/$ZnS_{0.9}Se_{0.1}$–*FF*=0.6; η=10.6% and for p-Si/SH4/$ZnS_{0.9}Se_{0.1}$/-*FF*=0.56; η=9.1%.

SIZE EFFECTOF SMALL FERROELECTRIC $BaTiO_3$ PARTICLES ON DIELECTRIC PROPERTIES OF A SMECTIC A LIQUID CRYSTAL WITH NEGATIVE DIELECTRIC ANISOTROPY

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Adding of submicron functional particles to liquid crystals (LC) in a small amount can cause enormous changes in the properties of the LC, and in some cases lead to qualitatively new effects, which are not typical for LCs. In order to achieve maximum results using these changes for practical purposes, the types and properties of both liquid crystal and functional particles should be varied. In the present work, the effect of the size of submicron particles of barium titanate ($BaTiO_3$) on the dielectric properties of smectic A LC with negative dielectric anisotropy was investigated.

In the experiment, monodisperse $BaTiO_3$ particles with sizes of 100 nm, 200 nm, 300 nm, 400 nm, and 500 nm were used. In the preparation of mixtures (colloids), it was not necessary to use a stabilizer due to the high viscosity of the smectic A liquid crystal. In all colloids, the concentrations of $BaTiO_3$ particles are the same and equal to $7 \cdot 1015$ m^{-3}. At this concentration, the average distance between the particles is about 5 μm.

The results of measurements are presented in the table:

LC	C2	C2+$BaTiO_3$ (100nm)	C2+$BaTiO_3$ (200nm)	C2+$BaTiO_3$ (300nm)	C2+$BaTiO_3$ (400nm)	C2+$BaTiO_3$ (500nm)
$\varepsilon'_{\parallel}$	3.9	4.0	4.1	4.4	4.8	5.2
$\varepsilon'_{\perp}$	12.73	12.78	12.88	12.89	12.86	12.93

As can be seen, the addition of ferroelectric particles substantially changes only the longitudinal component of the dielectric constant, and, the larger the particle size, the greater is the increase of the dielectric constant. While the transversal component of the dielectric constant remains almost unchanged.

$BaTiO_3$ particles also affect the dispersion of the dielectric constant of a smectic-A LC. The weak dispersion of $\varepsilon_{\parallel}^{'}$ observed at low frequencies (200 Hz) shifts towards higher frequencies. The magnitude of the displacement increases with particle size increasing. At the same time, the dispersion frequency of $\varepsilon_{\perp}^{'}$ shifts towards low frequencies (from 300 kHz to 200 kHz) and the degree of the shift depends on the size of the particles slightly.

The obtained results are explained by the existence of a local electric field around polarized $BaTiO_3$ particles.

ELECTRIC DOUBLE LAYER IN RAPIDLY CHANGING HELIUM PLASMA COLUMN

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Electric double layer in rapidly changing helium plasma column was investigated. We have assembled an experimental installation, in which the discharge was generated in a cylindrical glass chamber of 55 mm in diameter and 700 mm in length. The anode was placed in a movable narrow glass tube with an inner diameter of 18 mm. In the anode section, the discharge narrowed and an electric double layer of space charges was formed at the field of the narrowing. A movable cylindrical probe oriented across the tube allowed carrying out radial measurements in the area of the column narrowing. Moving the anode together with the narrow section of the tube along the discharge

chamber, it is possible to more the DL relative to the probe or spectrograph slit, and axial distributions of electrical and optical parameters of the plasma can be measured. The measurements were carried out in spectroscopically pure helium within the pressure range of 0.1 ÷ 0.5 Torr and discharge currents of 20 ÷ 500 mA in the absence of strata oscillations. Based on the measured distributions and concentrations, the numbers of excitations and ionizations in the DL area were calculated. The calculation of the EEDF was made from the kinetic equation for the measured potential profile.

The EEDF was measured by the second derivative method. In the narrowing section, a transition region is formed, consisting of electrical double layer with an electron space charge on the cathode side and positive ions space charge on the anode side. According to the Poisson's equation, the potential distribution changes in this region, the field increases sharply, electrons acquire additional energy, resulting in strong increase of ionization in the boundary region in the narrow section of the tube. A complementary energy appears on the EEDF, which corresponds to the group of electrons accelerated in the DL. As it moves along the steeply increasing branch of the distribution, the complementary energy shifts toward high energies. The value of the secondary maximum decreases and disappears rapidly as a result of elastic and inelastic collisions of electrons with atoms.

In the narrowing section, the electron concentration increases sharply, then drops almost to the level of concentration in the wide section of the tube and, in some cases, undergoes several such strong changes and reaches a constant value. This concentration behaviour is associated with the electron focusing effect, since the DL in the mouth of the narrow section has the shape of a spherical segment; hence, the accelerated electrons are focused towards the narrow section. The radial distribution of the concentration at the beginning of the tube's narrow section is substantially narrower than in more remote areas of the DL.

In order to enhance the effect of electron acceleration in the double layer, experiments to determine the rates of stepwise excitation reactions were carried out in a tube with a narrow diameter of 18 mm. The variable component of the current with a modulation depth = 20%

at a modulation frequency ν = 63 Hz was superimposed on the constant component of the discharge current with the help of a sound generator.

N_{m0} value is measured from the spectral line absorption λ = 388.8 nm, and $\alpha_{0m} = 3{,}5 \cdot 10^{-11}$ cm^3c^{-1} is calculated from the measured EEDF using direct excitation cross sections [1].

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VOLTAMPER CHARACTERISTICS AND TEMPERATURE DEPENDENCEELECTRIC CONDUCTIVITY OF THICK LAYERS OF LIQUID CRYSTALS

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The dependence of the electrical conductivity of thick layers (100–200 μm) of nematic and smectic liquid crystals on the observation time was studied at various fixed voltages. It was determined that as the applied voltage increases, relaxation processes accelerate. Also, the temperature dependence is exponential in both the nematic and the smectic liquid crystal: σ ~ exp (-ΔE / kT) where, the activation energy for different samples gets values of 0.8 -1.2 eV and depends on the content of ionic supplements.

In addition, in the case of a smectic liquid crystal, ΔE depends on the orientation of the liquid crystal molecules. The activation energy ΔE for planar orientation gets ΔE // ≈ 0.15 and for homeotropic orientation it gets ΔE ⊥ ≈ 0.20 eV. At relatively high voltages (U ≥ 0.5B), volt-ampere characteristics is linear and symmetrical.

TEMPERATURE DEPENDENCE OF RAMAN SPECTRUM OF $CdGa_2Se_4$

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Knowledge of phonon spectra, their dependence on temperature, pressure and other external factors are important in explaining the mechanisms of heat capacity, thermal expansion, thermal conductivity, sound absorption, etc. Joint theoretical and experimental studies of phonon spectra, lattice dynamics provide information about the phonon frequencies at point Γ(000) Brillouin zone (BZ) and interatomic bond constants, on phonon-phonon, phonon-electron interactions, etc.

It is known that, the dependence of the frequency of an optical phonon and its line half-width on temperature is caused by two effects - thermal expansion of the lattice and scattering of phonons on phonons and lattice defects. Therefore, studying of the temperature dependence of the frequencies of optical phonons, one can obtain information on the anharmonicity of interatomic interactions in a solid state. For this purpose, the Raman spectra of $CdGa_2Se_4$ were investigated in the temperature range of 8-300 K.

The measurements of the Raman spectra in the given temperature range were carried out on a setup assembled on the basis of a DFS-24 spectrometer. The YAG: Nd infrared spectrometer (λ = - 1.064 μm) was used as the excitation source. A photomultiplier tube FEU-79, operating in the photon counting regime, was used as a radiation detector. The temperature of the samples was controlled by a Constantan thermocouple. Single crystals were obtained by the gas transport reactions method. Crystalline iodine was used as a transporter. The grown crystals were subjected to x-ray analysis. The lattice parameters were determined a = 5.574Å, c = 10.756Å, c / a = 1.873. These results agree with the data of [1].

In the Raman spectra of $CdGa_2Se_4$ (Fig. 1), with the temperature rises from 8K to 300K, broadening of A^1 symmetry line at 138,9 cm^{-1} $CdGa_2Se_4$ was discussed. Such broadening of line, by the joint analysis of the literature data [2-4], explained by the weak anharmonism, due to connected with the three-phonon decay and natural defects in crystal lattice.

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LUMINESCENCE OF $Cu_3In_5S_9$ SINGLE CRYSTAL

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The luminescence of $Cu_3In_5S_9$ single crystals was studied at different temperatures under the exposure of laser radiation with λ = 1.15 μm. The luminescence was observed from the side of the excited surface. In the emission spectrum the observed lines depend on the pumping energy and temperature. The luminescence spectra of $Cu_3In_5S_9$ is measured at 77 and 4.2 K for different excitation levels. At low excitation levels, the emission spectrum contains one line with

an energy of 0.65 eV and a full width at half maximum of 15 MeV. The intensity of this peak increases linearly with an increase in the excitation level to 2.5·10^{2a} kV/cm^2 ·c. At the same time, a new emission line with a maximum at 0.67 eV and a full width at half maximumof 14 MeV appears, which intensity grows quadratically with increasing pumping. At a rating 2.5·10^{2a} kV/cm^2 ·c, the intensity of both lines is compared, and the prevailing shortwave line remains in the spectrum. It is assumed that the observed lines have an impurity character.

INFULENCE OF THERMAL TREATMENT ON PHOTOLUMINISCENTPROPERTIES OF PP/PbS/CdS NANOCOMPOSITES

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In given paper,were investigated photoluminiscence properties of PP+PbS/CdS nanocomposites in different temperatures (100^0C, 120^0C and 140^0C) in vacuum. At the same time,the optical band gap was calculated on the basis of the spectra of UV absorption and it was shown that the after thermal treatment optical band gap of nanocomposites is changing.This can be explained by the change in the upper molecular structure of the polymer matrix under the influence of thermal processing. At the same time,were investigated luminescence spectra of nanocomposites before and after thermal treatment in different temperatures (100^0C, 120^0C and 140^0C) in vacuum. It has been established that the highest luminescence intensity is observed in after thermal treatment in vacuum at 100^0C temperature. This can be explained by the fact that in this temperature the luminescent centers are increasing and more optimal structures are formed.

ELECTRICITY CONDUCTIVITY OF COMPENSATED $Gd_xSn_{1-x}Se$ CRYSTALS AND ANOMALOUS CHANGE OF HOLL'S COEFFICIENT

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İn presented article the analysis of the electrical conductivity of compensated $Gd_xSn_{1-x}Se$ system crystals and the results obtained from the Holl coefficient in the temperature range 77-400 K is being given. It has been established that the Holl's coefficient values are anomalous in the investigated composition. Conductivity varies from p-type to n at different temperatures. The obtained ingredients are compensated semiconductors.

$Gd_xSn_{1-x}Se$ system alloys x = 0,000; 0,001; 0,005 and 0,010 samples has been synthesized and subsequently filling in special ampoules, their monocrystals were obtained by the directed melting zone method. In order to create homogeneity, they were placed in a horizontal position in the heater and stored at T=620 K for t = 240 hours. After that physical-chemical analysis of samples was performed by X-ray (RFA), DTA. The analysis shows that the samples correspond to the given stoichiometric composition.

This is due to an increase in the Gd atom as a result of intensive scattering of the charged particles and the decline of the Holl walk. Thus, experiments have been summarized as follows: investigated $Gd_xSn_{1-x}Se$ are partially compensated semiconductor crystals; the composition varies depending on the amount of Gd atoms in the composition, the type of conductivity varies from p to n; it has been obtained anomalous changes in the T=420-460 K temperature as with the SnSe compound.

THE DEVELOPMENT OF PHOTODYNAMIC THERAPY TECHNIQUE FOR CANCER TREATMENT WITH NEW NANOPARTICLES

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Cancer is a leading cause of death worldwide; accountable for 7.6 million deaths in 2008 (Ferlay J et al. 2008). With 12.7 million new cases reported in the same year, global statistics predict over 20 million people will be diagnosed with cancer by 2030 due to the increase in life expectancy and population growth (Boyle, P. &. L. B. 2008). The demand for effective cancer treatments that address the current issues of systemic, conventional therapies is ever-increasing. Photodynamic therapy (PDT) is a minimally invasive, powerful tool that can be harnessed to treat a variety of cancers (De Rosa, F. S. et al. 2000;Veenhuizen, R. et al. 1997;Wang, J. B. et al. 2007;Wang, K. K. et al. 2008;Wang, X. H. et al. 2009). It requires the administration of a non-toxic drug, known as a photosensitiser (PS), which only becomes activated when illuminated by a light source at a specific wavelength (Kübler, A. C. 2005;Robertson, C. A. et al. 2009). In oxygenated tissues, this leads to the generation of cytotoxic species which consequently induce cell death and tissue degradation (Castano, A. P. et al. 2005;Schuitmaker, J. J. et al. 1996). The fundamental specificity of PDT is highly attractive in its application in oncology; however, the limited selectivity of the photosensitiser into malignant tissues is a crucial inadequacy, which results in adverse prolonged cutaneous photosensitivity. Additionally, light and dosage parameters need to be optimised to enhance its efficacy. This study aims to reduce inter-patient variability of PDT by improving the delivery of a potent PS, *meta*tetra(hydroxyphenyl)chlorin (*m*-THPC), into 'target' tumour tissues in comparison to normal tissues by its encapsulation into pegylated nanoparticles (NP).

ROLE OF OXYGEN AND HIDROGEN BONDS IN PHOTOLUMINESCENCE OF POROUS SILICON

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The effect of posttreatment in HNO_3 on the photoluminescence properties and surface chemical bonds of stain etched porous silicon were investigated. It was shown that, such posttreatment results in reversible quenching of photoluminescence. It is found that the photoluminescence quenching associated with significant desorption of hydrogen from the surface of porous silicon under the HNO_3 action, and its subsequent recovery associated with surface oxidation in air. This recovery of luminescence is correlated with the appearance of absorption on the oxygen bonds at 1180 cm^{-1} and 1045 cm^{-1}.

TEMPERATURE DEPENDENCE OF THE VOLTAGE OF ADDITIONALELECTRIC FIELD METAL - GaAs SCOTS DIODES

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The contact surface of real metal – semiconductor rectifying contacts, i.e. Schottky diodes are usually limited to it by adjacent free surfaces and due to this, an additional electric field arises around the contact, which penetrates into the peripheral near-contact region of the semiconductor and goes from the contact surface to the free surfaces of the contacting materials. The total contact surface of the Schottky diodes (SD) is characterized by peripheral and internal areas with different energy parameters. The voltage of the additional electric field in the peripheral contact area (Au-Cu) / n - GaAs SD arising due to the

limitation of the contact surface becomes temperature dependent. With a decrease in temperature from 320 K to 100 K, it and the ideality coefficient increase, and the potential barrier height of SD decreases. There are certain correlations between these SD parameters.

EFFECT OF THE EXTERNAL INFLUENCES ON PHOTOLUMINESCENCE EFFICIENCY AND DECAY OF Eu^{2+} DOPED $Ca_xBa_{1-x}Ga_2S_4$ AND $Ca(Al_xGa_{1-x})_2S_4$ SYSTEMS

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The detailed investigation of photoluminescence of Eu^{2+} doped $Ca_xBa_{1-x}Ga_2S_4$ and $Ca(Al_xGa_{1-x})_2S_4$solid solutions with full range of x from 0.1 to 0.9 was performed. The PL decay time constant were found to be from 305 ns to 470 ns for x from 0.1 to 0.9. The extreme stability of the shape and position of the emission spectra was found in wide range of excitation power density with the emission efficiency droop only above $2 \cdot 10^4$ W/cm^2.

MAGNETOTHERMOELECTRIC PROPERTIES OF THERMAL ELEMENTS ON THE BASIS OF CRYSTALS OF SOLID SOLUTIONS BISMUTH-ANTIMONY AND BISMUTH TELLURIDE-ANTIMONY TELLURIDE

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This paper presents the results of a study of temperature gradients arising on thermoelements manufactured on the basis of n-type Bi-Sb solid solutions (with 15 at.% Sb) and 69% Sb_2Te_3+27% Bi_2Te_3+4% Sb_2Se_3in the temperature range from 130K to 300K and magnetic field induction from B = 0 to B = 1.0 T. Crystals of solid solution 69% Sb_2Te_3+27% Bi_2Te_3+4% Sb_2Se_3 were grown by the Bridgman method and at 300K had a thermoelectric figure of merit Z $=3{,}2\text{x}10^{-3}\,K^{-1}$.

It is shown that the changes observed in the values of Z and $_{\Delta}T$ on thermoelements under the action of a magnetic field are mainly due to the change in the thermoelectric parameters of n-branches made of Bi-Sb crystals.

It is shown that the main thermo- and magnetothermoelectric parameters of energy converters developed on the basis of the extruded materials are close to the parameters of coolers manufactured on the basis of single-crystal materials. It was found that thermoelements and converters based on the developed material are distinguished by high reliability of parameters and are suitable for operation as part of electronic devices.

VAPOR-PHASE SYNTHESIS OF COPPER-BASED NANOSTRUCTURES

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This presents the preliminary results of our study on the formation of different nano- and microstructures by condensing the volatile precursors that were synthesized on the surface of a solid Cu source after its annealing in gaseous ambient containing ammonium chloride and hydrazine. In addition, several illustrative data are also presented on the growth of nanostructures formed after annealing of CuO source in the same gaseous ambient. Further investigations are needed to understand the processes which lead to the formation of such nanomaterials with required characteristics.

FLUCTUATION OF THE MAGNETIC MOMENT OF MAGNETITE PARTICLES DEPENDING ON THE SIZE OF PARTICLES

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In the present work, were investigated structure and magnetic properties of the magnetite nanoparticles with different size. The average size of Fe_3O_4nanoparticles were studied by SEM. Differences in structure were investigated by IR and XRD spectroscopies.XRD analysis showed that with the changing of the size of nanoparticles lattice parameters of the material also change. On the other handhe magnetic properties of the nanoparticles at room temperature were

investigated. Relatively small particles show superparamagnetic effect at room temperature. Besides, the value of saturation magnetization is the same (69emu/g) for both samples. It is one of the most important properties of stabil superparamagnetic materials.

AB-INITIO CALCULATIONS OF ELECTRONIC STRUCTURE OF CdFeTe AND OPTICAL PROPERTIES

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First principle calculations based on density functional theory by the pseudopotential method, by use of Local Spin Density Approximation in the Atomistix ToolKit program carried out to define band gap, density of states, total energy, magnetic moments, number of electrons, Fermi levels of $Cd_{1-x}Fe_xTe$. $Cd_{1-x}Fe_xTe$ epitaxial films on glass substrates were obtained. Absorption and transmission spectra were investigated. It was defined, that with an increase in Fe concentration there is an increase in the band gap.

DIELECTRIC PROPERTIES OF CdMnTe(Se) SEMIMAGNETIC SEMICONDUCTORS

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It was investigated temperature dependences of dielectric constant and conductivity of CdMnTe(Se)semimagnetic semiconductors at frequencies of 25Hz-1MHz, at temperatures of 294-550K.

It was found that with increasing of temperature, an increase in c, and is observed, the slope of the curves remains constant. It have been defined that in the all dependencesthe higher the frequency of the measuring field, the later begins the growth of c, ε and σ. The parameters remain almost unchanged up to temperature of 480÷500K over the entire studied frequency range. A maximum are observed at a temperature of 500÷550K. The conductivity at temperature of 500K at low frequencies is 2.5x10-6 S/cm.

SYNTHESIS AND STRUCTURE OF HYBRID POLYMER NANOCOMPOSITES BASED ON PP +CdS/ZnS

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In this paper in first time was synthesized and characterized of hybrid polymer nanocomposites based on PP+CdS/ZnS. It was found that for nanocomposites based on PP + ZnS the band gap is 3.65 eV, for PP+CdS-2.8 eV and for PP+CdS/ZnS nanocomposite it is 4.25 eV. SEM images of polymer nanocomposites show that ZnS and CdS nanoparticles are equally uniformly distributed inside the polymeric polymer matrix of polypropylene. Photoluminescent analysis of nanocomposites has shown that for such hybrid nanocomposites, the spectral sensitive spectral region is expanded.

ON THE FORMATION AND ELECTROPHYSICAL PROPERTIES OF SOLID SOLUTIONS $TlIn_{1-x}Dy_xS_2$

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The transport properties of $TIInS2$- $TIDyS2$ solid solutions were studied.The solubility of $TIDyS2$ in $TIInS2$ was found to be 8 mol. % .

The solid soliutions were crystallize in tetragonal symmetri with the $TIInS2$ structure. As the TIDy$S2$ content rises, the lattice parameters of the alloys increase and the band gap decreass almost linearly. Temperature-dependent conductivity and Hall data are used to elucidate the mechanisms of carrier scattering and conduction in TIDy$S2$ and the $TIInS2$- TIDy$S2$ solid-solutions system.

MOLECULAR DYNAMICS NANOSCALE PHENOMENA: COMPUTER DESIGN FOR NEW DRUGS AND MATERIALS

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Molecular simulation studies are performed within the research activities of Molecular Dynamics (MD) modeling group of Neutron Optics sector in the Department of Neutron Investigations of Condensed Matter, Frank Laboratory of Neutron Physics (FLNP), Joint Institute for Nuclear Research (JINR), thereby outlining the international research collaborations closely performed with Japanese groups (Keio University, Waseda University, RIKEN, etc.). The examples have to cover a general issue on “Computer Design for New Drugs and Materials”, which demonstrate the efficient use of computer MD in both classical (conventional) and quantum chemical methods implementations. Some aspects of our recent studies include computer modelling of nonequilibrium chemo-electronic conversion of water adsorption on the surface of yttria-stabilized zirconia.

ELECTROCHEMİCAL OBTAİNİNG OF SELENİUM-CONTAİNİNG RHENİUM CLUSTERS

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Electrochemical obtaining of nano-coatings in the system Re-Cu-Se on platinum electrode during voltammetric cycling was studied. The research was carried out from sulphate solution containing selenious acid, calium perrhenate and cupric chloride. According to the researches of voltammetric dependences during co-electrodeposition of calium perrhenate ions (VII), selenium (IV) and copper (II) from sulphate electrolytes on Pt electrode the conditions of potentiostatic deposition of thin films in the system Re-Cu-Se were established. To study the morphology of films on platinum and copper substrates the surface of an electrode was investigated using scanning electron microscope. It was determined that agglomerates consisting of spheric particles with average size of ~20-25 nm are observed on the surface of an electrode.

SYNTHESIS OF MWCNTs FROM MIXTURE OF XYLENE BY A-CVD METHOD

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This research material deals with the synthesis of multi walled carbon nanotubes (MWCNTs) by aerosol-assisted chemical vapor deposition (A-CVD) method. The effect of rarely used and less studied carbon source-mixture of the xylene (ortho- (o-), meta- (m-) and para- (p-))isomerson the quality, purity and cost of synthesized MWCNTs have been analyzed. Thus, the selected carbon source is more affordable and cheaper than orto-, meta- and para- xylene isomers separately. Separation of thexylene mixture, costly process and therefore have an impact on the price of the synthesized product. The surface morphology, shape and diameter distribution of the MWCNTs was analyzed using Scanning Electron Microscope. The purity, quality, structure, phase identification of the carbon nanotubes determined by Raman spectroscopy and XRD analysis.

INFLUENCE OF ELECTROTHERMOPOLIZATION CONDITIONS ON STRENGTH AND ELECTRET PROPERTIES OF PP +ZrO_2 NANOCOMPOSITIONS

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This paper deals with the investigation results of electret state mechanical and electric strength before and after electrothermal treatment. There have been presented AFM images of PP+ZrO_2 nanocomposition after and before electrothermal polarization (ETP). It is established that electrothermal polarization has a profound effect on electret and strength properties of nanocomposition and it is due to the accumulation charge at the phase interface between nanocomposite components.

MODIFIED ZONE MELTING METHOD: MODELLING OF COMPONENTS CONCENTRATION DISTRIBUTION IN Ge-Si SINGLE CRYSTALS

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The conception of modified zone melting method for growing of single crystals of semiconductor solid solutions is given. The task of component concentration distribution in Ge-Si crystals grown up by this method with use of germanium seed is solved in Pfann approximation. The axial concentration profiles of components in crystals grown at different values of operation parameters (melting zone

length and composition of initial macro-homogeneous ingots Ge-Si) are calculated taking into consideration the complicated dependence of silicon segregation coefficient on melting zone composition. The possibility of control of component concentration distribution along Ge-Si crystals in wide range by way of change of melting zone length is shown. The analysis of obtained results determines the optimal technological operation parameters for growing Ge-Si crystal solid solutions with given homogeneous composition or gradient concentration profile of components on single crystal length.

THE STRUCTURAL FEATURES OF P(VDF-TeFE)/Si COMPOSITES MODIFIED BY GAMMA-RAYS

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On the basis of comparative analysis of the IR spectra of Initial and gamma irradiated composites obtained on the basis of copolymers of polyvinylidene fluoride tetrafluoroethylene (P(VDF-TeFE)) and Si nanoparticles, we investigated the causes of changes in their structure.

Based on the analysis of IR spectra obtained before and after the gamma radiation of P(VDF-TeFE)/nano-Si composites, shown that the crystallization rate of the system is increasing as a result of the interaction of the active centers formed on the matrix with the surface of Si nanoparticles on the interphase boundary. The optical properties of P(VDF-TeFE)/nano-Si composites based on the P(VDF-TeFE) polymer is varied depending on the amount of filler and the dose of radiation, and this change provides the observed changes in the electrophysical properties of the composites.

PHOTOVOLTAIC PROPERTIES OF In_2O_3-InSe-Pt SYSTEM

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Based on a layered InSe crystal, In_2O_3-n-InSe-Pt diode structures were fabricated. Samples InSe with thicknesses of 10 ÷ 80 μm and geometrical dimensions of 3x3 mm were made by splitting from large ingots. According to Hall measurements at 300 K, the mobility reaches a value of ~700 $cm^2/V\cdot sec$, a specific resistance of ρ ~ 80 ÷ 300 Ω·cm, the concentration of current carriers is $n\sim1\cdot10^{14}$ cm^{-3}. Transparent and conductive In_2O_3 layers were obtained by evaporating a mixture of In_2O_3 powder (90%) and indium (10%) using the method described in [1]. The evaporation of In_2O_3 was carried out under oxygen pressure of $\sim8\cdot10^{-5}$mm Hg. The deposition rate of the films was ~20 A^0/min. The thickness of the transparent and conducting In_2O_3 layer was 650÷1200 A^0 and had the following physical parameters: ρ~ (0.2÷7) Ωcm, μ = (4÷12) $cm^2/V\cdot s$, $n\sim(1\div2,6)10^{20}$ cm^{-3}. The current-voltage characteristics, capacitance-voltage characteristics, and In_2O_3-n-InSe-Pt photosensitivity spectra were experimentally studied. It was shown that the coefficient of rectification of the studied samples reaches ~100 at U = 0.5 V, the photosensitivity spectra cover the range from 1 to 0.7 microns. From the energy diagram, the In_2O_3 band gap is determined, which turned out to be 3.5 eV. Estimates show that the light conversion ratio to In_2O_3-n-InSe-Pt reaches a value of ~ 6%.

ELECTRICAL AND HEAT PROPERTIES OF BULK NANOSTRUCTURED SAMPLES OF $Bi_{85}Sb_{15}$ SOLID SOLUTION

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Extruded bulk nanostructured samples of the $Bi_{85}Sb_{15}$ solid solution were obtained by hot extrusion. It was found that their electrical parameters and lattice thermal conductivity substantially depend on the grain size and post-extrusion annealing. The data obtained are explained by the dependence of the electron concentration, the degree of texture, re-crystallization, and disorientation of particles in the sample on particle sizes, as well as phonon scattering at grain boundaries.

CONFOCAL RAMAN MAPPING OF $CdGa_2S_4$ AND $ZnGa_2S_4$ CRYSTALS

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In the given work, Raman spectra of $CdGa_2S_4$ and $ZnGa_2S_4$ crystals were measured and investigated with comparing each other. Raman scattering spectra have been measured by confocal Raman spectrometer “Nanofinder 30” (Tokyo Instr., Japan). As an excitation source, the second harmonic generation of the YAG:Nd^{3+} laser with λ = 532 nm wavelength and 10 mVt was used. The spectral distribution was no worse than 0.5 cm –1. A CCD camera (1024 to 128 pixels) thermoelectrically cooled to –100°C and operating in the photon-counting mode was used as the detector of the scattered radiation.The

investigations are carried out in backscattering geometry. It was determined that Raman frequencies for $CdGa_2S_4$was 219 cm^{-1},310 cm^{-1}, 350 cm^{-1} , 85cm^{-1} , 136cm^{-1} , 166cm^{-1}, 240cm^{-1}, 297cm^{-1}, 323.5cm^{-1}, 364.5cm^{-1}, 393cm^{-1}, for $ZnGa_2S_4$ was 230cm^{-1}, 319cm^{-1}, 108cm^{-1}, 137.5cm^{-1}, 169.5cm^{-1}, 270cm^{-1}, 278cm^{-1}, 337.5cm^{-1}, 374cm^{-1}, 397.5cm^{-1}. On the 50 mkm×50 mkm surface of $CdGa_2S_4$ and $ZnGa_2S_4$ crystals for 219 cm^{-1} and 230 cm^{-1} phonons which have maximum intensity according to FWHM, maximum position and maximum value of spectral lines were taken the mapping. According to the comparison of obtained 2D and 3D images the surface of $CdGa_2S_4$ crystal is much more homogeneous than $ZnGa_2S_4$.

THERMAL CONDUCTIVITY OF $Sm_xSn_{1-x}Se$CRYSTALS AND MOBILITY OF CARRIERS

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Thermal conductivity and current carriers of Sm doped $Sm_xSn_{1-x}Se$ crystals were investigated in the 77-400K temperature range.The results indicate that scattering of phonons and current carriers occurs due to the lattice deformation which emerges around Sm dopig centers.

INVESTIGATION OF THE MECHANISM OF BREAKDOWN OF SCHOTTKY DIODESDEPENDING ON THE METAL MICROSTRUCTURE

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In this work the mechanism of diodes with a Schottky barrier is studied using the influence of the microstructure of a metal on the breakdown. It is shown that in the electronic processes, occurring in the

contact between a metal and a semiconductor, the metal plays a very active role and is a more important contact partner than a semiconductor. Polycrystallinity of a metal transforms a homogeneous contact into a complex system, which consists of parallel-connected multiple elementary contacts having different properties and parameters

INFLUENCE OF FULLERENES ON THRESHOLD VOLTAGE, DIELECTRIC AND CONDUCTIVITY PROPERTIES OF SMECTIC A LIQUID CRYSTAL 10NF

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Influence of fullerenes on threshold voltage, dielectric and conductivity properties of smectic A liquid crystal 10NF is investigated. It is shown that the transverse component of the real part of dielectric permittivity increases at the additive of fullerenes while the longitudinal component decreases. At this case, a maximum of dielectric absorption shifts to the high-frequency region. Conductivity increases at low frequencies and decreases at the high ones. Experimental results are explained on the base of the Maier-Meier theory for anisotropic liquids and also participation of fullerenes in ionic conductivity of liquid crystal.

NANOSTRUCTURED POROUS Si-Cu_2ZnSnS_4 THIN FILMS

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Nanostructure CZTS thin film was fabricated by electrodeposition technique. To manufacture the heterojunctions, p-type c-Si wafers of (100) orientation were used as a substrate. Before anodization, the surface of the c-Si substrates were etched in an aqueous solution of HF and further washed in distilled water (at temperature of 80°C and ethyl alcohol and then dried in air. The current-voltage characteristics of the CZTS /PS solar cell under dark conditions show that forward bias current variation approximately exponentially with voltage bias. The capacitance for Nano- CZTS /PS Solar Cell decreases with the increase of the reverse bias voltage and with the increasing of etching time of nPS layers. That heterojunctions demonstrate good photo-response in the wavelength range of 510 ÷ 650 nm.

THE STRUCTURE AND DIELECTRIC PROPERTY STUDIES OF THE NANOCOMPOSITES BASED ON POLY(VINYLENE FLUORIDE) AND İRON NANOPARTICLES

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Have been studied the structure and dielectric properties of polymer nanocomposites based on polyvinildenfluorid and iron nanoparticles. The structure of polymer nanocomposites investigated by scanning electron microscopy (Jeol JSM-7600 F), SEM studies show that with increasing volume fraction of iron particles change the supramolecular structure of the polymer and increase the size of the particles (45-130 nm) in the polymer. It was shown that the dielectric permittivity of nanocomposites on the based of PVDF + Fe varies similarly to pure polymer matrices in low concentrations of Fe nanoparticles, but for high concentrations it was observed different dependence. It was found that from 100 Hz the value of dielectric permittivity begins to decline and didn't change practically during the subsequent increase of frequency. This is due to the delay interfacial of polarization at high frequencies compared to the frequency of the field and as a result, the weaking of the polarization process. It was also studied the temperature

dependence of the dielectric permittivity, dielectric loss tangent and the values of the specific resistance of nanocomposites based on PVDF + Fe. The dielectric permittivity has been observed to decline from 373 K in volumes of 5% and 10% of Fe nanoparticles in a polymer matrix, which is explained with an increase in temperature the disturbance of the regularity of the dipoles therefore decrease of the polarization of the nanocomposites.

SYNTHESIS OF TITANIUM DIOXIDE NANOPARTICLES FOR PHOTOCATALYTIC DEGRADATION OF COD IN WASTEWATER UNDER ULTRAVIOLET IRRADIATION

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Chemical Oxygen demand (COD) is a measurement of the oxygen required to oxidize soluble and particulate organic matter. Also it is important water quality parameter because, COD provides discharged wastewater will have on the reeving environment. This report describes the synthesis of titanium dioxide particles with photocatalytic properties and their application for the treatment of COD in wastewater. Only anatase type crystalline titanium oxide were synthesized. The phase and microscopic properties were characterized by X-ray diffraction and Scanning Electron Microscopy. The nanoparticles were determined, and their photocatalytic activity was studied under the UV-lamp for COD degradation.

Theoretical and Mathematical and High Energy Physics

RELATIVISTIC QUANTUM MECHANICS DESCRIPTION OF NEUTRINO SPIN-FLAVOR OSCILLATIONS IN MATTER AND A PLANE ELECTROMAGNETIC WAVE

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We study the application of relativistic quantum mechanics to study neutrino spin-flavor oscillations in external fields. In particular, we discuss oscillations of neutrinos in matter under the influence of a plane electromagnetic wave. Neutrinos are supposed to be massive Dirac particles with nonzero magnetic moments. First, we find the exact solution of the wave equation for a single neutrino mass eigenstate in the considered external field. Then, we apply this result to describe spin-flavor oscillations between electron and muon neutrinos. Finally, some astrophysical applications are discussed.

ON THE ISSUE OF REDUCING HARMFUL NOISE IN THREE-PHASE VIBRATORS

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Harmful noise as a factor in the production environment leads to the need to limit its level. Noises and vibrations, as well as electromagnetic fields and radiations, ionizing radiations and effects of

radionuclides are related to energy pollution of the technosphere. And the noises and vibrations of varying intensity and spectrum, while acting for a long time, have an adverse effect on the human body and general well-being.

Devices that enrich the environment with noise pollution are vibrators. Vibrators using a variety of energy resources, air, water, steam and electrical energy are widely used in industry. A magnetic core of electromechanical vibrators in industrial and household appliances is usually made of electrotechnical steel with a thickness of $(0.35 \div 0.5)\cdot 10^{-3}$ m.

Due to the fact that as a result of heating, one-sided lacquer coatings between electrical sheets are gradually destroyed, gaps between them are formed and as a result of which under the influence of electromagnetic induction forces, vibrations with an industrial frequency of 50 Hz arise between the sheets. This leads to overheating of the winding located on the core and failure of the winding wires. The main part of vibrators can cause asymmetrical distribution in the electrical network, depending on the wiring diagram.

Taking into account the above-mentioned shortcomings, we have developed a new design of the vibrator and made its working model layout.

To eliminate asymmetry in the electrical network, the vibrator of a new design is powered by a three-phase AC source.

The one-piece magnetic core is made of steel 45, which has a very high magnetic permeability. Since the core is made solid, a peculiar noise hum in the magnetic core, the air space has noticeably decreased.

The vibrator is powered by alternating current with an industry frequency of 50 Hz from a three-phase phase regulator. Power-supply voltage is 80 ÷ 100 V. The design of the vibrator consists of the following parts: axis, top cover, nut, washer, stud, yoke, winding, middle cover, spring, bottom cover.

In electromechanical devices, elementary sound waves interacting with sound waves with the same length of used electromechanical devices in the amount of *n*, create a resonant effect.

And it creates noise in the environment. Reducing the noise level in three-phase vibrators allows them to be used as a sieve for sifting on process lines, turning grain into flour in mills, for fruit sorting, and also in construction as basic electromechanical devices at concreting, laying of concrete and asphalt pavements.

In short, noise pollution by electromechanical devices is detrimental to human health. Since noise pollution is an industrial waste for the environment, the prevention or reduction of noise pollution remains one of the most pressing urgent problems.

STUDY OF CHANGE WIDES OF CORONAL SPECTRAL LINES AT HEIGHT IN CROWN AND SUN DISK

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Observations show that the width of the coronal spectral lines undergo changes both in the solar disk and in the Corona height above the solar edge. Coronal lines expand with thermal and non-thermal movements. It is clear that these changes are caused by changes in the velocities of non-thermal movements. The observed changes are rather contradictory: according to some data, the values of non-thermal movements on the solar disk are 10–22 km/s, and on the limb 15–40 km/s; according to other observations, these speeds on the disk are constant and equal to 26 km/s, and over the limb they increase to 30 km/s. There are observations in which it is shown that the speeds of non-thermal movements, on the contrary, decrease with altitude in the Crown. Most observers agree that non-thermal motions are isotropic in the Crown.

Many authors believe that non-thermal movements are movements on Alfven waves. We believe that the approximate isotropy of non-thermal motions can be explained by motions on Alfven and slow magneto-sound waves at the same time. The work is devoted to the determination of the mean-square velocities of non-thermal

velocities for various variants.

Calculations were carried out for different phase intervals for slow magneto-acoustic waves observed in the central regions of the solar disk. In this case, the line of sight is directed along the propagation of the wave, and therefore, parallel to the movements on the wave. The mean square velocities of the movements extending the spectral line, for the full period, should be determined by the expression:

$$U_{rms} = \sqrt{\frac{1}{2\pi}\int_0^{2\pi} U_{amp}^2 sin^2(t)dt} \qquad (1)$$

Here U_{amp} is the amplitude of the wave. During the exposure, it may happen that several (n) waves and part (m) of the wavelength are covered.

$$U_{rms} = U_{amp}\sqrt{\frac{1}{2\pi(n+m)}\int_0^{2\pi(n+m)} sin^2 x dx} = U_{ampl}\left[\frac{1}{2} - \frac{1}{8\pi(n+m)} sin2\pi m\right]^{1/2} \qquad (2)$$

Here m<1 takes into account part of the wave, taking into account the value of cf. sq. speeds on the wave. The calculation of the mean square velocities of non-thermal motions on Alfven waves in the phase interval 2π (T_i-T_{i+1}) was made when observed on a disk closer to the limb for the value of the difference T_i-T_{i+1}=10 s, since the exposure time during filming is ~10s; wave period T = 300 s. It is of interest to calculate the value of non-thermal velocity by the expression

$$U_{rms} = \sqrt{\frac{1}{T_i - T_{i+1}}\int_{T_i}^{T_{i+1}} (f(t))^2 dt}.$$

Here

$$f(t) = U_{amp} sin\left(\frac{2\pi t}{T}\right).$$

In our opinion, when observing along the propagation of a wave, the rms velocities at delayed acoustic waves do not depend on the phase magnitude; when Alfven waves are observed closer to the limb at small values of the phase intervals, the values of the mean square velocities of the non-thermal values strongly depend on the phase.

As a conclusion, the following can be said: when observing

along wave propagation (in the central parts of the disk), the mean-square velocities at slowed-down acoustic waves do not depend on the magnitude of the phase interval; when Alfven waves are observed closer to the limb (perpendicular to the wave propagation) for small values of the phase intervals, the values of the mean square velocities of non-thermal motions strongly depend on the phase.

SPECTROPHOTOMETRIC CHARACTERISTICS AND PARAMETERSASYMMETRIES OF INFRARED LINES IN THE SPECTRA OF THE SUN

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The work defines spectrophotometric characteristics and asymmetry parameters of spectral lines in the infrared region of the spectrum of the total flux from the entire disk of the Sun.
As an observational material, spectral materials obtained by Kurucz R.L., et al. using Fourier spectrometers with high dispersion and high resolution were used. For this study, we selected only single unblended lines in the spectral range λλ 7000–9000 ÅÅ. Were built profiles selected approximately 50 spectral lines. The lines used were mainly Fe I, Si I, Cr I, Ni I, Na I, etc. The dispersion in the material used is 2 mÅ/mm. The main characteristics were determined: central depth R0, equivalent width W, half width $\Delta\lambda_{1/2}$, and profiles with great accuracy.

To build the studied profiles of the Fraunhofer lines and determine their spectrophotometric characteristics, the ORIGIN program was used.

According to the data obtained, the asymmetry of profiles using the Kuli-Zade method was investigated. The integral – Λ and the residual - $\Delta\Lambda$ asymmetry was defined.

According to the data obtained, the dependence of these quantities on equivalent widths of lines is constructed. As can be seen, with an increase in the equivalent width, the integral asymmetry increases slightly, and the residual asymmetry almost does not change.

The asymmetry of the spectral lines in the spectrum of the Sun is caused by non-thermal motions in its atmosphere. According to the theory of the formation of spectral lines, strong lines, i.e. lines of greater equivalent width are generated in the higher layers of the atmosphere. Of interest is the fact that, the residual asymmetry does not depend on the equivalent width, i.e. the speeds of non-thermal movements are the same across the entire height of the atmosphere. And the integral asymmetry shows a small increase in the speeds of non-thermal movements with height. This interesting fact requires further research.

ASSYMETRY CLASSIFICATION IN THE SPECTRUM OF THE SUN

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On the basis of the obtained data we separated the following classes by the character of a line profile asymmetry:

I class - lines, for which $\Lambda_{\square} = 0$, i.e. line profiles are totally characterized by violet asymmetry.

II class - lines, for which $\Lambda_{+} = 0$, i.e. line profiles are totally characterized by red asymmetry.

III class - lines, for which $\Delta\Lambda>0$, i.e. violet asymmetry predominates.

IV class - lines, for which $\Delta\Lambda<0$, i.e. red asymmetry

predominates.

V class - lines, for which Λ= 0, i.e. line profiles are symmetric.

VI class - lines, for which ΔΛ =0, i.e. both asymmetries have the equal force.

Asymmetry of lines profiles has a complex, fine structure. In the range of the given line profile the asymmetry may change its value and sign repeatedly, i.e. violet asymmetry [ed in one depth can be changed by red asymmetry [□(R)<0], asymmetry may change to a violet one. In some depths of the profile □(R)»0 may be observed, i.e. asymmetry does not occur. This probably is associated with the change of physical conditions in photosphere with the depth. The lines can be classified in three groups on a nature of change of asymmetry inside the profile:

1. Throughout the depth of profile □(R)>0, i asymmetry is observed, asymmetry changes only by value;

2. Along the whole depth of profile □(R)<0, i asymmetry is observed, asymmetry changes only by value;

3. In some depths of profile □(R)>0, b profile □□ (R)<0 a sign.

PRECISE DIFFUSION COEFFICIENT FOR PLANETARY NEBULAE AND ITS RELATION TO DYNAMIC AGE

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Diffusion coefficient is one of the important parameters of planetary nebulae. Since radii of central stars of planetary nebulae have been determined indirectly up to now, it was impossible to calculate diffusion coefficient precisely. For the first time we have suggested a new method to determine directly central stars of planetary nebulae. This method allows defining diffusion coefficient accurately. By

determining diffusion coefficient precisely we may define ionizing degree of atoms in nebula more precisely. This enables to study the stratification of radiation which is one of the relevant problems of nebulae. Calculations were conducted for 60 planetary nebulae, it was found that the change of diffusion coefficient for different nebulea is 10^{-13}-10^{-20}. Besides, the dependence which indicates the decrease of diffusion coefficient of nebulae with the increase in their dynamics ages, was obtained. This shows that over time sizes of nebulae grow and due to this radiation density reduces. This in its turn confirms the precise calculation of diffusion coefficient of nebulae.

THEORETICAL CONFORMATIONAL ANALYSIS OF THE C-TERMINAL TETRAPEPTIDE FRAGMENT OF THE BAM-22P

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We studied the structural and functional properties of a number of the above opioid peptides, this work is a continuation of our previous studies. We have investigated in detail the spatial structure of the peptide molecule BAM-22P. Therefore, a theoretical conformational analysis of the C-terminal tetrapeptide fragment Lys19-Arg20-Tyr21-Gly22 of the BAM-22P peptide molecule was performed.

The conformational possibilities of the tetrapeptide fragment of the BAM-22P were studied by the theoretical conformational analysis method. The conformational potential energy of the system was chosen as the sum of the contributions of non-valent, electrostatic, torsional interactions and the energy of hydrogen bonds. The potential function of the system is chosen as the sum of non-valent, electrostatic and torsion interactions and the energy of hydrogen bonds. Non-valent interactions were assessed by Lennard-Jones potential. Electrostatic

interactions were calculated in the monopole approximation by Coulombs law using partial charges on the atoms. The conformational capabilities of the tetrapeptide molecule are studied under the conditions of the water environment, in connection with which the value of the dielectric constant is assumed to be 10. The energy of the hydrogen bonds was estimated using the Morze potential. The low-energy conformations of the tetrapeptide molecule, the values of the dihedral angles of the main and side chains of amino acid residues were found, the energy of intra-and inter-residual interactions was estimated.

As can be seen from the amino acid sequence of the tetrapeptide fragment, two positively charged amino acid residues lysine and arginine are next to each other, and therefore electrostatic repulsion occurs between them. In this case, such fragment conformations are realized, when the electrostatic repulsions between the lysine and arginine are the smallest. In low-energy structures, dispersive attractions arise between the residues Lys19-Tyr21, Arg20-Tyr21 and Tyr21-Gly22, which contribute to the total energy up to -5.0 kcal /mol.

EDGE STATES IN CORBINO DISK IN THE PRESENCE OF RASHBA AND DRESSELHAUS SPIN-ORBIT INTERACTIONS

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Edge states in Corbino disk in the presence of Rashba spin-orbitinteraction (SOI) and in-plane Zeeman magnetic fieldis solved exactly. We consider a two-dimensional (2D) electron gas in the presence of Rashba and Dresselhaus spin-orbit interactions (SOI) under perpendicular magnetic field and in-plan plane electric field with Hamiltonian. We show the spin-orbit interactions split the energy spectrum into two branches, yielding for a given value of the energy two non-trivial values of the momentum. The energy spectrum is determined from the boundary condition.

The obtained wave-functions allow to calculate edgecurrent. The problem is shown to be solvedexactly in the presence of radial electric field. We show that in the presence of Dresselhaus SOI, apart from of Rashba SOI,the magnetic quantum number is not conserved and the wave function isexpressed as a linear combination of all wave functionscorresponding to each magnetic quantum number. Nevertheless, the problem is solved numerically.

THE DECAYS OF $H(h;A)$ HIGGS-BOSONS INTO TWO PHOTONS

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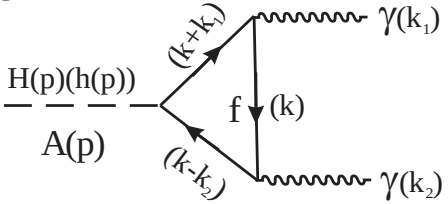
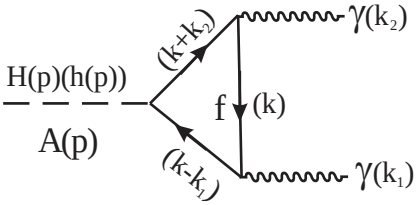
In recent times, thanks to the discovery of the standard Higgs boson at the Large Hadron Collider, interest in the channels of birth and decay of bosons has increased significantly. Higgs bosons of the Minimal Supersymmetric Standard Model (MSSM) H, h and A can decay through various channels. We have investigated the decay channels of these bosons into circularly polarized photons:

$$H(h) \Rightarrow \gamma + \gamma, \tag{1a}$$

$$A \Rightarrow \gamma + \gamma. \tag{1b}$$

Photons, like massless particles, do not directly interact with Higgs particles. $H(h;A) \Rightarrow \gamma + \gamma$ decays go through loopback diagrams with virtual charged particles. Here we consider the fermion loop diagrams show in Fig.1 (4-particle momenta are written in brackets)





a) b)

Fig1. Fermion loop diagrams of decay $H(h;A)\to\gamma\gamma$

The circular polarization of the photon is taken into account by the 4-vector $e^*_\mu(k_1)=(0,\vec{e}^{\,*}(k_1))$, where

$$\vec{e}^{\,*}(k_1)=\frac{1}{\sqrt{2}}(\vec{\beta}-il_1[\vec{n}_1\vec{\beta}_1]), \qquad (2)$$

$\vec{n}_1$ is the unit vector in the direction of the photon momentum $\vec{k}_1$, $\vec{\beta}$ is the unit vector perpendicular to the photon momentum $((\vec{\beta}\,\vec{n}_1)=0)$ and $l_1=\pm1$ characterizes the circular polarization of the photon, with $l_1=+1(-1)$, the photon has right (left) circular polarization.

For the decay width $\Phi\Rightarrow\gamma+\gamma$ $(\Phi=H;h)$, taking into account circular polarizations of photons, the expression is obtained:

$$\Gamma(\Phi\to\gamma\gamma)=\frac{G_F\alpha^2_{KED}M^3_\Phi}{512\sqrt{2}\pi^3}\cdot(1+l_1l_2)\left|\sum_f N_C Q_f^2 g_{\Phi ff}\cdot\frac{2}{\tau_f^2}[\tau_f+(\tau_f-1)f(\tau_f)]\right|^2. \qquad (3)$$

where $\tau_f=\dfrac{M^2_\Phi}{4m_f^2}$ $(\Phi=H;h)$.

From the decay width formula (3) it follows that photons should have either the right one $(l_1=l_2=+1)$ or left $l_1=l_2=-1$ circular polarization. The state in which one of the photons has the right and other left, $l_1=-l_2=\pm1$, is prohibited by the law of conservation of the total moment.

Summing over circular polarizations of photons, for the decay width $\Phi\to\gamma+\gamma$ we get:

$$\Gamma(\Phi \to \gamma\gamma) = \frac{G_F \alpha_{KED}^2 M_\Phi^3}{128\sqrt{2}\pi^3} \cdot \left| \sum_f N_C Q_f^2 g_{\Phi ff} \cdot \frac{2}{\tau_f^2} [\tau_f + (\tau_f - 1) f(\tau_f)] \right|^2 \quad (4)$$

In the decay $A \to \gamma + \gamma$ the decay width is equal:

$$\Gamma(A \to \gamma\gamma) = \frac{G_F \alpha_{KED}^2 M_A^3}{8\sqrt{2}\pi^3} \cdot \left| \sum_f N_C Q_f^2 g_{Aff} \cdot \frac{2}{\tau_f} f(\tau_f) \right|^2 . \quad (5)$$

THE METHOD OF ATMOSPHERIC CORRECTION OF SATELLITE IMAGES.RESTORE SPECTRAL BRIGHTNESS OF THE EARTH'S SURFACE

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The article presents an optical model of the altitude distribution of aerosol layers of the atmosphere in the lower atmosphere, developed by the author on long-term optical data. On the basis of this model, the problem of atmospheric correction of satellite images and restoration of the spectral reflection coefficient of reflected solar radiation for the Caspian-Caucasian region is solved. The problem of restoration of microstructural parameters of the optically active accumulative fraction of atmospheric aerosol is considered simultaneously in the article.

Hα AND Hβ LINES IN THE SPECTRUM OF THE Ae HERBIG STAR HD190073

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In this paper we have presented results of research the time variability of the line profiles of Hα and Hβ in the spectrum of Herbig Ae/Be type star HD190073. The Hα line profile consists of an emission peak, in which two separate components are barely distinguished at the top. The blue wing of the line is flatter than the red. On the blue wing there is a wide and shallow absorption. The asymmetry in the profile shows that there is both accretion and outflow of matter on the circumstellar disk.

The Hβ line profile has the same structure as the Hα line (Fig.1). However, on this line, the emission is in the core of the line and broad photosphere wings characteristic of class A stars stand out well. Minor asymmetry is also observed on the profile of this line.

We have discovered a change in the radial velocities of the emission component of the line in the time scale of about 45 days. This is accompanied by a decrease in the equivalent width of the emission Hα. This shows that it is possible an eruptive process is occurred on the surface of the star.

CHANGE OF BALMER JUMP IN MAGNETIC CP-STARS

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Based on the materials obtained in 10-color photometric system, Balmer jumps (D) were determined for 23 different magnetic CP-stars of spectral class B0-F0. The value D was determined for the effect of peculiarity of stars. The values u-x which are altitude index of Balmer jump and change by the rotation period of stars, were simultaneously determined. It was known that Balmer jumps are reduced in the region of spots on the average by $\Delta D \approx 0.06$. The most changes were observed for silicon stars ($\Delta D=0.10$). It was concluded that the change and decrease of Balmer jump is related to the changes in the structure of atmosphere and caused by peculiarity effect – presence of strong magnetic field and anomalies in chemical composition in the region of spots on the surface of studied stars.

SPECTRAL VARIABILITY H_βLINE OF THE Ae HERBIG TYPE STAR HD 179218

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The results of spectral observations of the Herbig Ae/Be type star HD 179218 are presented. Two wave-like cycles of variability in the parameters of hydrogen lines Hα and Hβ with a characteristic time of ~ 40 days are revealed. The first wave of variations is deeper; the branches of decreasing and increasing the spectral parameters of the lines are more clearly expressed. At the time of the first minimum, in

the profile of the emission line Hα the appearance and disappearance of additional blue and red emission components are observed. At the same time, narrow absorption components were discovered in the Hβ line. Synchronously with this, a significant variation in the lines of He I, Si II, D NaI, [OI] was observed. In addition, the parameters of many spectral lines shows variations with smaller amplitude and with a characteristic time of 10-20 days. Possible mechanisms of the observed variability of the star are discussed.

THE STUDY OF THE SPATIAL STRUCTURAL ORGANIZATION OF THE MOLECULEOF THE HERPES VIRUS

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The spatial possibility of the H-Tyr-Ala-Gly-Ala-Val-Val-Asn-Asp-Leu-OH molecule corresponding to the sequence 329-337 of the C-terminal region of the ribonucleotide reductase subunit 2 of the herpes virus was studied by the method of theoretical conformational analysis. We used this method in the study of the capabilities of the synthesized peptide; therefore, the present work is a continuation of our studies of the structural-functional organization of peptide molecules.

By using the solid phase approach, was synthesized peptide molecules H-Tyr-Ala-Gly-Ala-al-Val-Asn-Asp-Leu-OH (I), which corresponds to the sequence 329-337 of the C-terminal portion of the subunit 2 of the herpes simplex ribonucleotide reductase (HSVR2) and its analogues, with a mono substitution at position 329, as well as modifications at the N- or C-terminus.

The spatial structure of peptide (I) was studied by multiple fragments. The conformational analysis of fragment Tyr^{329}-Ala-Gly-$Ala\text{-}Val^{333}$ was performed with regard to low-energy conformations of tyrosine, alanine, glycine and valine.

The computation revealed a sharp energy differentiation among

the backbone conformations. The spatial structure of the fragment Val^{333}-Val-Asn-Asp-Leu^{337} was studied on the basis of the low-energy conformations of valine, asparagine and aspartic acid and leucine.

The computation of the pentapeptide fragment was carried out on the basis shape. For all 16 different shapes, we computed all the possible backbone conformation. The spatial structure of the H-Tyr^{329}-Ala-Gly-Ala-Val-Val-Asn-Asp-Leu^{337}-OH (I) was investigated on the basis of the stable conformations of the pentapeptide fragments Tyr^{329}-Val^{333} and Val^{333}-Leu^{337}. The computations revealed considerable energy differentiation of different shapes and forms the nonapeptide backbone.

Thus, based on the theoretical conformational analysis of the molecule (I), a conclusion was obtained about the structural organization of the protein fragment.

GENEALOGICAL COEFFICIENTS OF KINSHIP IN THE DIRECT NUCLEAR REACTIONS

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The coefficients of fractional parentage are obtained for clusters in direct nuclear reactions, each with angular momentum *L,S* coupled into a total angular momentum *J,* in terms of products of the genealogical coefficients of kinship. Thegenealogical coefficients of kinship obtained for *L* and *S* corresponding to conjugate representations of the symmetric group. This method is demonstrated to provide coefficients of kinship for *L–S* states for systems with a considerably larger number of particles than is feasible using the procedures heretofore available. Study was carried out in the impulse approximation with plane waves and based on Gaussian potential. Example is given of the use thus constructed coefficients of fractional parentage in evaluating matrix elements (*p,t*) reaction. The expressions

are found for the genealogical coefficients of kinshipof an arbitrary bineutron cluster configuration in the form of a product of single-shell the genealogical coefficients of kinshipand matrix elements of the transformation matrices of the permutation group. The results is very significant in that the number bineutron clusters dependent factor has been completely factored out. Simultaneous (single-stage) and sequential (two-step) transmission channels for this approach clearly do not differ.

THERMAL ACTIVATION in SMALL JOSEPHSON JUNCTION

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In this study we carried out the analysis of the thermal activation of small Josephson junction (JJ). An expression for the fluctuation of Coulomb blockade edge in the case of low and hig
h growing rate of voltage was obtained. It was shown that, dynamics of small size JJ under termal fluctuations is determined by the energy ratio-parameter, temperature and growing rate of voltage

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SPATIAL STRUCTURE OF ARGININ-CONTAINING PENTAPEPTIDES

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Peptides regulate all functions of a living organism. Using the regulatory peptides of the human body, you can create new and effective drugs. It is known, that proline and glysin containing peptides had a protective effect in microcirculatory dysfunction under conditions of inflammation and stress. One of the basic problems for molecular biophysics is investigating their structure–functional organization. This work is devoted to study the spatial organization, conformational possibilities of the glyproline pentapeptide molecules Pro-Gly-Pro-Gly-Pro, Pro-Gly-Pro-Arg-Pro and Pro-Arg-Pro-Gly-Pro. The calculations were carried out by the method of theoretical conformational analysis and a special computer program. Calculation of glyproline pentapeptides has been carried out by the method of theoretical conformational analysis with regard to nonvalent, electrostatic and torsional interactions and energy of the hydrogen bonds. The low-energy conformations of these molecules and the values of the dihedral angles of the main and side chains are found and the energy of the intra- and inter-residue interactions is estimated. The conformational mobility of the amino acid side chains is investigated and the amino acids with specific interplays with different receptors are founded.

The conformational possibilities of pentapeptide Pro-Gly-Pro-Gly-Pro were studied in fragments. First, the conformational properties of the dipeptide Pro-Gly and the tripeptide Pro-Gly-Pro were determined based on the stable conformations of the monopeptides N-acetyl-L-proline and L-glycine. Then the spatial structure of the pentapeptide Pro-Gly-Pro-Gly-Pro was studied. The low-energy conformations of the natural peptide were used as the initial structural states to explore the conformational possibilities of the artificial analogues Pro-Gly-Pro-Arg-Pro and Pro-Arg-Pro-Gly-Pro.

The results can be used to study the spatial structure of hexapeptide glyproline molecules, as well as to study the conformational capabilities of side chains when interacting with receptor molecules.

MOBILITY OF ELECTRONS IN A SEMICONDUCTOR QUANTUM WELL WITH THE MODIFIED PÖSCHL-TELLER CONFINING POTENTIAL

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Mobility of electrons in a semiconductor quantum well are studied. The modified Pöschl-Teller potential is used as a confining potential to provide a better fit to experimental data. The shape of this potential is intermediate between that of square and parabolic wells. In most experiments, performed on quantum wells, analysis of the results shows that electrons occupy only one (the lowest) energy level. In this case, as a parameter of potential, we can take $\lambda = 1$.

The electric field is directed parallel to the plane of quantum film. In this plane the motion of electrons is not confined, so Boltzmann's kinetic equation can be used to determine the electron distribution function. Scattering rate is calculated taking into account the screening of scattering potential by electrons. It is shown that in the case of high degenerate electron gas the screening significantly increases the mobility of electrons. At low temperatures, the main scattering mechanism is scattering by impurity ions. The calculation shows that the ionized impurity scattering rate is directly proportional to the surface density of ions, and does not depend on temperature.

Dependence of electron mobility on surface electron density is studied. It is shown that this dependence is almost linear. Obtained results are applied to $GaAs/Al_xGa_{1-x}As$ quantum wells. The theoretical results qualitatively coincide with the results of the experiment.

.DESCRIPTION OF THE DECAY $\sigma \to \pi\pi$ IN QUANTUM FIELD THEORY

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In this paper we present our results of the investigation of multi-quark equations in the Nambu--Jona-Lasinio (NJL) model in the mean-field expansion. We have considered multi-quark functions. We discuss also the generalization of the method for other types of multi-quark sources.

THE COLLECTIVE BEHAVIOR OF THE PARTONS AND ITS INFLUENCE ON THE JET SUPPRESSION IN HEAVY ION COLLISIONS.

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We discuss the physical picture wherein a parton interaction with a coherent group of partons can lead to amplify the jet quenching in the hot and dense matter was created in the heavy ion collisions at RHIC and LHC energies. This picture is concluded after analyzing the behavior of the Nuclear Modification Factor as a function of p_T for the charged particles produced in the most central Pb-Pb collisions at 2.76 A TeV. In the interval of p_T =7-50 GeV/c the values of the Nuclear Modification factor, as a function of p_T increase almost linearly with a slope, is very close to expected ones for the inverse Compton effect. Around $p_T \cong$ 60 GeV/c, a major change, which is characteristic of this phenomenon, occurs. It is proposed that this similarity can be explained by the inverse Compton effect happening via a collective parton group

formation (the appearance of a new string as a result of fusion of strings) and its interactions with single partons in the interval of $5 < p_T < 10$ GeV/c. In the case of a coherent collision, a low energy parton can gain energy through the inverse Compton effect, resulting in its acceleration and shifting to the region of $p_T > 10$ GeV/c. After losing a significant part of its energy this new string will decay into partons having lower energies - slowed partons in the interval of $p_T < 5$ GeV/c. This enhancement in the jet quenching can be observed in the interval of $2 < p_T < 20$ GeV/c.

CHARACTERISTIC FEATURES OF THE CHANGE OF THE SPECTRAL TYPE OF THE SEYFERT GALAXY NGC 2617

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For decades, astronomers wondered why we see internal regions in some active galactic nuclei, but not in others. The most popular explanation is a different viewing angle: if the AGN is located flat relative to the observer from the Earth, then a hot gas falling in a spiral into its black hole can be considered, and if it is tilted to the line of sight, only slow moving gas clouds will be visible light year distance or more from the black hole. However, there are AGNS that do not fit into these representations: they can either open the inner region of the nucleus or hide it, in other words, changing look their type.

The unification model of the AGN explaining the diversity of types with only a different orientation to the observer is very popular, but has a number of problems and in particular is not able to explain the

cases of rapid type changes. We assumed that such changes are not exceptions, but occur regularly in all AGN variables during their evolution. The differences in the types of AGNs are undoubtedly associated with different levels of absorption, but it is obvious that these changes cannot be explained by rapid changes in orientation. We assumed that the absorption changes due to shifts in the rate of accretion and variations in the luminosity of the central source in the AGN, which leads to changes in the dust concentration in clouds on the line of sight. Earlier, a model of conical outflow of dust clouds was proposed, which allows one to naturally explain the results of the independence of infrared delays on the wavelength, as well as cases of type change in AGN (Changing Look AGN (CL AGN).

We believe that the abrupt change in the spectral type of the Seyfert galaxy NGC 2617 was not associated with the increase in brightness observed in 2013, but it is likely that the change in spectral type occurred a little earlier, and then eats between October 2010 and February 2012. This result is confirmed by the observations of the international robotic network MASTER conducted in the period 2010-2016.

We determined the lag time in the K band (2.2 μm) relative to the optical variability in NGC 2617 in 2016 was about 25 days, which coincides with the estimate of the radius at which dust should be sublimated. For NGC2617, lags between variability at different wavelengths are defined. These results partially confirmed the previously obtained results, which are partly new and original, in particular the determination of the lag time of flow variations in the filter K, the relative optical variability is the first reliable result for this object.

We firstly discovered the presence of a variable emission component in the H_β line profile in the Seyfert galaxy NGC 2617 and noted that similar features are characteristic of other galaxies that changed their spectral type.

SURFACE PHOTOMETRY OF ORION PROPLYDS

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An important task in modern astrophysics is studying the formation of planets and protoplanetary disks. Studies of the characteristics of stars and protostellar formations, as well as the structure of protostellar disks in the region of the Orion Nebula, are key here. The brightest objects in this region are the stars: θ^1 Ori C (Sp O6p) and θ^2 Ori A (Sp O9) the members of the Orion Trapezium θ Ori. We used direct images of the vicinity of θ^1 Ori C taken from the Hubble Space Telescope MAST archive as observational material for this study. We selected the brightest proplyds located near θ^1 Ori C for our study. All the objects we chose are located no more than 16″ from θ^1 Ori C. Results of studies of the surface-brightness distributions of a group of young stellar objects located within 16″ of the star θ^1 Ori C are presented. Isophotes around each proplyd are constructed using violet, red, and near-infrared images. The measured relative intensities are converted to absolute fluxes, and the absolute luminosities of the brightest parts of the disks and of the disk peripheries are estimated. The maximum lengths of the proplyd tails in various filters range from 300 to 700 AU. They become shorter with decreasing distance from the illuminating star.

SOME PROBLEMS OF THE DATA ANALYSIS

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In 2012 Abreu et al. have published a paper entitled "Is there a planetary influence on solar activity?", in which the authors have put forward the idea that long-term fluctuations of solar activity are probably connected with oscillations caused by the planetary tidal torque exerted on the solar tachocline. Abreu et al. (2012) show that the cycles of the planetary tidal torque correlate with the long-term cycles in proxies of solar activity. They used annually averaged time series of tidal torque, which became the subject of critical remarks by Poluianov and Usoskin (2014). Note that some rebuttals related to this paper already exist (Abreu et al. 2014, Scafetta et al. 2016). Despite it we have decided to dwell on it in detail, since there are some issues concerning the data analysis that go beyond the limits of the examined task and are significant not only for astrophysics.

INVESTIGATING THE EFFECT OF METHANOL AND RHODAMINE ON SILK FIBROIN STRUCTURE THROUGH FTIR SPECTROSCOPY

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Fourier-transform infrared spectroscopy (FTIR) is a useful tool to monitor Silk Fibroin (SF) conformational changes. FTIR spectra of silk fibroin films in the amide regions (1800–1200 cm^{-1}) are correlated with Silk I (1655, 1540, and 1235 cm^{-1}) and Silk II (1630, 1520, and 1270 content, an indicator of the conformational properties of the self-

assembled protein[1].

In order to investigate secondary structural change of Silk Fibroin (SF), FTIR spectra were measured for an aqueous SF solution and for films obtained by water annealing and methanol (70%) treatment, two commonly used approaches to form β-sheet crystals. FTIR spectra were also measured to investigate the effect of Rhodamine (RHD) on SF structure.

Deconvolution of the amide I bands of the films and solution showed that the total β-sheet content is higher in films (48.4%) with respect to solution (38.8%), while, as mentioned, 70% methanol treatment induces additional β-sheet formation(57.4%). The component at 1615 cm^{-1} represents intermolecular β-sheet aggregate due to stacked β-sheets from different molecules, stabilized by side chain interactions, as observed in β-amyloids**.** Amyloid size and rigidity determine the frequency of this band, with the largest and most rigid amyloids absorbing near 1620 cm^{-1} and the smaller, more disordered and less rigid amyloids absorbing at about 1635 cm^{-1}[2]**.** FTIR spectral analysis indicates the presence of β-sheet aggregate (12.1%) that increased up to 22.9% by treatment with alcohol. Water annealing or alcohol treatment of some SF:RHD films exhibited β-sheet aggregate in the range of 6.4–11%, always lower than the amount observed for SF films treated with alcohol.

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QUANTUM CHEMICAL STUDY OF THE SPATIAL AND ELECTRONIC STRUCTURE OF A DIAZACROWNETHER WITH H-LYS-LYS-OH DIPEPTIDE FRAGMENT IN THE MACROCYCLIC RING

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Since antibiotic resistance is one of the biggest threats to global health, the development of safe and effective medicines that are able to ensure prevention and treatment of infectious diseases is the problem of highest priority. The development of new effective antibiotics is very expensive and time consuming process, so quantum chemical calculations suggest a good tool used for design of new materials with predetermined properties. Cationic cyclic peptides reveal excellent antimicrobial activity and are used as auxiliary agents in drug delivery systems. In this paper, we report of new peptide based antimicrobial agent diazacrown ether with a H-Lys-Lys-OH dipeptide fragment in a macrocyclic ring for biomedical and pharmaceutical applications. Diazacrown ether with a dipeptide fragment in a macrocyclic ring can be obtained by condensation of dialdehyde with a lysyl lysine dipeptide H-Lys-Lys-OH. The spatial and electronic structure of the diazacrown ether molecule with the H-Lys-Lys-OH dipeptide fragment in a macrocyclic ring has been investigated by the quantum-chemical method of the DFT electron density functional theory with the hybrid potential B3LYP in the Gaussian09 software package. For the calculation, we used extended basic sets with allowance for the polarization and diffuse functions 6-31G (d) and 6-31+G (d, p). An optimized macrocycle structure and its spacial, energy, and electronic parameters are obtained. To confirm that the obtained optimized

structure is a global minimum, the vibrational spectrum was calculated.Have been carried comparative analysis of the data obtained by calculations in different bases. The structural rearrangements, the electronic structure, and the energies of the HOMO and LUMO orbitals of the formed macroheterocycle are analysed. Calculations show that the proposed model of the molecule forms a stable structure. Stabilization of obtained macroheterocycle can be ensured by the formation of non-covalent interactions within the cyclic structure.

ABOUT THE STRUCTURE OF ATOMIC NUCLEUS

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Propose the electron-proton structure of the atomic nucleus and relativistic-invariant equation of Gordon-Klein-Puasson on base of which new interpretation of nature and structure of atomic nucleus and nuclear forces is provided. Partial solutions *of* this equalization have been considered in order to estimate the nucleus potential properties.

THE EFFECT OF IRRADIATION WITH Fe^{7+} IONS ON THE STRUCTURAL PROPERTIES OF TiO_2 FOILS

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Thin foils based on the TiO_2 phase of brookite, 620 nm thick, were obtained by magnetron sputtering. The samples were irradiated at

the DC-60 heavy ion accelerator of the Astana branch of the Institute of Nuclear Physics with Fe^{7+} ions with energy of 85 MeV with a fluence of 1×10^{11} to 1×10^{14} ions/cm^2. The dependences of the change in the concentration of defects in the structure of thin films on the radiation dose are established. It has been established that an increase in the irradiation fluence of up to 10^{14} ions/cm^2, characteristic of the formation of defect overlap regions, leads to a sharp decrease in the degree of crystallinity and an increase in the lattice parameters.

STUDYING the E2 TRANSITIONS in NUCLEI USING the SUBGROUP SU(5)

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The transitional behaviour of low-lying energy levels, E2 transition rates, and some other related quantities across the entire subgroup SU(5) are studied in detail. Exploiting the related symmetry group SU(5) was received simple analytic expressions for the eigenvalues of the boson Hamiltonian and for the intereband transition matrix elements E2. It should be noted, considered the finite dimensional systems in contrast with the geometrical description-tion in which number of bosons $N\rightarrow\infty$. The collective and intrinsic degrees of freedom can be mixed through residual terms of the Hamiltonian, such as the rotation - vibration interaction. It is proposed to describe the collective vibrational degree of freedom by an algebra SU(5), which is formed by five components.

ENERGY PROCESSES IN THE CASE OF DISTRIBUTIONBOLTZMAN IN GRAVITATIONAL FIELD

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The paper considers the theoretical solution of convective processes from an energy point of view in the ideal case in the gas phase, the released energy in these processes is calculated.

SAGROPHYSICAL PROPERTIES OF GRAY-BROWN IRRIGATED SOILS UNDER THE VEGETABLE CROPS OF THE ABSHERON PENINSULA OF THE REPUBLIC OF AZERBAIJAN

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The Absheron peninsula is one of the most developed regions of commercial vegetable production in Azerbaijan. Despite the fact that in recent years, Absheron has given preference to the cultivation of vegetable crops in greenhouses, the intensive development of cultivating vegetables in the open field has also not lost its significance. Agrophysical properties of soils are of great importance in the agronomic and environmental aspects of growing vegetables. The best soils for irrigated industrial vegetable growing are light and medium loams, whose agrophysical properties provide favorable conditions for the growth and development of most vegetable crops. To determine the current state of vegetable-suitable soils of the Absheron peninsula, researches were conducted, the main agrophysical and agrochemical properties and soil regimes were determined, on the basis of which a characteristic of irrigated gray-brown soils of the studied region was given.

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MICROTURBULENT VELOCITY IN THE ATMOSPHERES OF F SPECTRAL CLASSES STAR

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The microturbulence is investigated in the atmospheres of some F spectral classes stars by the atmosphere model.The microturbulent velocities are determined on the basis of comparison of the values measured from observation and theoretically calculated equivalent widths of lines FeII. It has been found that the microturbulent velocity (ξ_t)depends on the surface gravity (g) in the atmospheres of the star: $\xi_t$decreases with increasing g. The microturbulent velocity is less in the stars with intense atmosphere.

The microturbulent velocity is determined in the atmospheres of the stars using theatmosphere model for the F-spectral classes HR382 $(\varphi Cas, F0Ia)$, HR6978 $(45\mathrm{Dra}, \mathrm{F7Ib})$, HR690 (V440Per, F7Ib), HR7847 (44Cyg, F5Iab), HR6685 (89Her,F2Ib), HD161796 (F3Ib) supergiant stars, HR6707(F2II), HR8718(F5II) giant stars, HR1543 $(\pi^3 Ori, F6V)$, HR7061 (110Her, $F6V$) the main sequence stars.

The observations materials of the stars were obtained on a 2-meter telescope of Shamakhi Astrophysical Observatory of ANAS.

The determination of the mikroturbulent velocity using the model method is based on the study of the equivalent widths in a wide range of neutral atoms or ions spectral lines of any element. The equivalent widths W_λ of the spectral lines of the considered element is calculated by giving different values to the microturbulent velocity and and it is compared with the equivalent widths measured from observation. The abundance of element $lg\varepsilon$ is calculated for the different values of the mikroturbulent velocity ξ_t in each spectral line. The abundance of element lgε does not depend on the equivalent widths W_λ of its spectral lines, ξ_t is determine the atmosphere of the investigated star which corresponds to the graph.

The iron abundance $log\varepsilon(Fe)$is calculated by giving different values to the microturbulent velocity $\xi_t$in the atmosphere of each star on these models. The iron abundance is determined on the basis of comparison of the values measured from observation and theoretically calculated equivalent width of the lines $FeII$.

The microturbulence velocities are determined using the atmosphere model method:

For the HR382 (φCas, F0Ia) star, $\xi_t = 6$ km/sec,
For the HR6978 (45Dra, F7Ib) star, $\xi_t = 4.8$ km / sec,
For the HR690 (V440Per, F7Ib) star, $\xi_t = 5$ km / sec,
For the HR7847 (44Cyg, F5Iab) star, $\xi_t = 5$ km / sec,
For the HR6685 (89Her, F2Ib) star, $\xi_t = 6.5$ km / sec,
For the HD161796 (F3Ib) star, $\xi_t = 6.5$ km / sec,
For the HR6707 (νHer, F2II) star $\xi_t = 3.5$ km / sec,
For the HR8718 (F5II) star, $\xi_t = 3.0$ km / sec,
For the HR1543 (π^3Ori, F6V) star, $\xi_t = 3.0$ km / sec,
For the HR7061 (110Her, F6V) star, $\xi_t = 3.0$ km / sec .

It has been found that the microturbulent velocity (ξ_t)depends on the surface gravity (g) in the atmospheres of the star: $\xi_t$decreases with increasing g. The microturbulent velocity is less in the stars with intense atmosphere.

INVESTIGATION OF THE ATMOSPHERE OF HR6978 (45Dra, F7Ib) STAR

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The atmosphere of supergiant star HR6978(45Dra, F7Ib) investigaed by using the atmosphere model method. The following values of parameters effective temperature and surfase gravity have been received:T_{eff}=6000±50 K, logg=1,7±0.07. On the lines FeII has

been investigated the parameter microturbulence (velocity). Found that for HR6978(45Dra, F7Ib) star ξ_t=4.8km/s.In the
atmosphere of the star the iron and carbon abundances are calculated and compared with the abundance
in the Sun. The iron and carbon abundances are determined by the comparison of measured from
observation and theoretically calculated values of equivalent width correspondingly FeII, and CIlines.
The iron abundance is close to the abundance in the Sun and the carbon abundance is less than the
Abundance in the Sun: $\log\varepsilon(\text{FeII}) = 7.49 \pm 0.18$, $\log\varepsilon$ (C) = 7.82 $\pm$0.2.

The effective temperature of the star and the surface gravity are determined by the model method.

The following criteria are used:

1. Comparison of the values of the index$[c_1]$ measured from observation and theoretically calculated.
2. Comparison of the measured from observation and theoretically calculated values of the index β.
3. Comparison of the measured from observation and theoretically calculated values of the index Q.

The following values of parameters effective temperature and surfase gravity have been received:

T_{eff}=6000±50K, logg=1,7±0.07

In the atmosphere of the star, mikroturbulent movement velocity ξ_t and amount of iron are determined by the lines $FeII$. To determine the mikroturbulent velocity ξ_t it must be a plurality of lines that contain a wide equivalent widhts range of the atoms or ions of any given element. The microturbulent movement velocity ξ_t is chosen such that the quantity of elements determined by the different linesdoes not change with the increasing of the equivalent widths W_λ.

HIGGS BOSON RADIATION IN ELECTRON-POSITRON COLLISIONS

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In this work discuss the process of the associated production of the Higgs boson H and a longitudinally polarized heavy fermion pair in the annihilation of an arbitrarily polarized electron-positron pair $e^- + e^+ \to (\gamma^*; Z^*) \to H + f + \bar{f}$. The analytical expression of the differential cross section of the process is obtained, the features of the cross section behavior, the angular correlations of particles, the left-right spin asymmetry A_{LR}, the degree of longitudinal polarization of the fermion P_f, and the transverse spin asymmetry $A_\perp$ are investigated. The results of the calculations are illustrated with graphs. The possibility of experimental measurement of the coupling constant g_{Htt} is discussed.

STABILITY OF THIN PLATES WITH HOLES

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The problem of determining the critical load for thin plates with holes is solved. The problem is solved using the functions of a complex variable in combination with the Galerkin method.

CONFIENEMENT MODEL OF THE HARMONIC OSCILLATOR

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A confienement model of the Harmonic oscillator with position-dependent mass is considered.

STUDY OF HIGGS BOSON PRODUCTION IN ASSOCIATION WITH A SINGLE TOP QUARK pp->tH

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In the Higgs sector NP can manifest itself either as a small deviation of precisely measured Higgs boson properties from the SM predictions, or as an observation of Higgs boson production or decay modes which are forbidden or suppressed in SM. In current work we search for the production of the SM Higgs boson in association with a single top quark. Such process is strongly suppressed in the Standard Model. An observation of this production mode would be an unambiguous indication of the New Physics providing an important insight on the nature of the Higgs mechanism.

SEARCH FOR THE ASSOCIATED PRODUCTION OF A HIGGS BOSON AND A TOP QUARK PAIR IN MULTILEPTON

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A search for tt‾H production in multilepton final states has been performed using 80^fb−1 of proton-proton collision data at √s=13 TeV recorded by the ATLAS experiment at the Large Hadron Collider. Six final states, targeting Higgs decays to WW *, ττ, and ZZ*, are examined for the presence of the Standard Model (SM) Higgs boson: one light lepton and two hadronically-decaying τ lepton candidates (1l+2τ had); two same-charge light leptons without any hadronically decaying tau lepton (2lSS); two same-charge light leptons with one hadronically decaying tau lepton (2lSS+1τ had); three light leptons without any hadronically decaying tau lepton (3l); three light leptons with one hadronically decaying tau lepton (3l+1τ had); and four leptons (4l).

Physical and Technical Foundations of Alternative Energy Sources

SOLAR ENERGY POTENTIAL OF THE REPUBLIC OF AZERBAIJAN

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The Republic of Azerbaijan is rich in solar, wind and other renewable energy sources and has working experience in their use. İnvestigation show that, utilization of solar energy in our country is ecologically and economically viable.

The solar energy potential of the Republic of Azerbaijan is 45.2 billion kWh. Using this potential, we can get huge revenues from the export of oil and gas resources of our country.

THE ROLE OF PROGNOSIS AND ITS ESTIMATION IN THE MANAGEMENT OF CONSTRUCTION FIELD DEVELOPMENT

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In the article the role of prognosis and planning in the management process of construction sector is investigated. The author has paid particular attention to the application of the prognosis method in the construction and achievements, the classification of business objectives as a socio-economic system, the integrated assessment of social housing construction and so on.

The prognosis is investigated as a systematic approach to study the changes in the environment of construction enterprises. Such an approach makes it possible to determine the probable state of environment as well as variation options and goals appropriate to those options . From this point of view, in this paper the prognosis is studied as task of management, the use of the resources and capabilities of the enterprise in agrement with the external environment is analyzed.

RENEWABLE ENERGY IN FOCUS: PECULIARITIES OF THE LOCAL RELIEF DEPENDENT MOUNTAIN-VALLEY WINDS

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In this work aimed to overview some sources of alternative energy and to show the results of scientific research of mountain-valley winds in arbitrary local relief. The features of mountain-valley winds are considered, depending on the complex geographic conditions of the region. The dynamics of the loss of wind speed during zigzag flow through mountain gorges and narrow passages and the effect of these losses on the wind flow characteristics are analyzed. It is planned to conduct scientific research to determine the available wind potential and to bring the profitability of a particular type of alternative energy sources in the Southern Caucasus.

ANALYSIS OF GEOMETRIC MODELING IN DESIGN

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When solving many problems in the field of computer-aided design and technological preparation of production, it is necessary to take into account the shape of the designed object. In this sense, geometric modeling is considered the core of computer-aided design and technological preparation of production. Information about the geometrical characteristics of the object is used not only to obtain graphic images, but also to calculate various characteristics of the object and technological parameters during its manufacture. Information on the external geometric shape of the projected object is considered to be an integral element of the design and production process.

ADJUSTMENT OF CONSUMPTION ELECTRIC ENERGY INCONDITIONS OF TRANSITION PERIOD

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Within the framework of the game theory, models for mathematical substantiation of the scientific and economic approaches to these topical issues describing the profitability of the use of energy sources in the housing and business complex and in the production sectors are being built. Some perspectives of the use of these models in the regulation of tariffs for the above types of communal-housing and industrial services in

the conditions of monopoly for these services (the 'product') are given. The strategies of the consumer and producer are studied in detail for adjusting the tariff with the amount of consumed 'products'. The tariff issues are analyzed taking into account the interests of the consumer and the manufacturer of these products. Discussions are held on the results of the study and ways of prospective studies on these topics are given and the geography of the application of research results to price adjustments and consumed 'products' under conditions of a transition period and inflation is indicated.

ISSUES OF ECONOMIC PROBLEMS' SOLVING OF RENEWABLE ENERGY SOURCES ACQUISITION

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Hereby in this article the issues on renewable energy sources acquisition were researched by the means of economic aspects. Development of the use of alternative energy sources within many world countries were studied and as a result optimal model was created. But to ensure the functionality of this theoretic model some real-life economic issues must be solved in convenient way. The main goal of this article is to discover the possibilities to achieve the realistic positive solution of those problems. At the end of current article as a conclusion there are given common renewable energy economic problem solution suggestions.

IONIC LIQUIDS AS HEAT TRANSFER FLUIDS IN SOLAR THERMAL SYSTEMS

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Densities of the binary ionic liquids [BMIM][PF_6], [BMIM][FAP], [BMIM][TFO] + methanol mixtures have been measured using Anton Paar VTD (DMA HPM, DSA 5000 M, SVM 3000, and DMA 5000M) installations at temperatures T=(273.15 to 413.15) K, at ambient pressure and mole fractions of methanol x=(0 to 1). The combined expanded uncertainty of the density, ρ, temperature, T, and concentration measurements at the 95 % confidence level with a coverage factor of k = 2 is estimated to be $\Delta\rho/\rho$= ±0.08 %, ΔT= ±15 mK, and Δx= ±0.0001 mole farction, respectively. The measured values of density for the mixtures were used to calculate derived volumetric properties such as excess and apparent molar volumes. Derived values of V_m^E for mixtures are very large and negative over the whole composition range for each experimental isotherms. $V_m^E - x$ curves are highly asymmetric which are very typical for alcohol containing binary mixtures.

Biological and Medical Physics

MOLECULAR MECHANICS AND DYNAMICS STUDY OF HYPOTENSIVE PEPTIDE NOVOKININ

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Novokinin (Arg-Pro-Leu-Lys-Pro-Trp) is a potent vasorelaxing and hypotensive peptide designed based on the structure of ovokinin 2-7, a bioactive peptide derived from ovalbumin. It has attracted much attention due to its variety of pharmacological and biological characteristics. Novokinin, having affinity for the AT2 receptor, shows the antihypertensive, vasorelaxing and antiopiod activities. Novokinin also inhibited the KCl- and $CaCl_2$-induced vasocontraction. The experimental results show that relaxed effect of novokinin on porcine coronary arteries might relate to the function of nitric oxide (NO), cyclic guanosine monophosphate (cGMP) and the synthesis of prostaglandin, but not involve adrenergic β-receptor. The wide range of physiological activity of novokinin has been attributed to the lack of conformational specificity and flexibility of this hexapeptide for a particular receptor type.

The conformational properties of the hypotensive peptide novokinin have been studied by molecular mechanics and dynamics method in vacuum and in environment with water molecules in this work. Calculation has shown that spatial structure of novokinin is discribed as the few compact folded structures in vacuum and in water. It was established that the spatial structures of this hexapeptide has tendency to keep a folded quasicyclic conformations, stabilized by hydrogen bonds. It was determined the values of dihedral angles of all possible conformations and their intermolecular interactions energies.

The obtained results and discussion lead to the following conclusions: (I). molecular mechanics method and molecular dynamics simulations in vacuum as well as in aqueous solution confirm the small flexibility of the sequence of novokinin; (II). the β-turn conformation on Arg1- Lys4 segment of peptide was more stabilized with the predominant hydrogen bonds $CO(Pro^2)\ldots NH(Arg^1)$, $COO(Trp^6)\ldots NH_2$ (Arg^1), $COO(Trp^6)\ldots NH_3$ (Lys^4) ; (III) the molecular dynamics simulations for novokinin indicated that relatively high stability of the low-energy conformations resulted not only from nonvalent interactions between residues but also from hydrogen bonds networks ; (IV) the β-turn conformation at the N-terminal part were more stabilized in vacuum and in polar medium provide optimal nonvalent interactions between residues. The determined structures of novokinin may be used as the basis for the design of further peptidic selective antagonists.

ZEISS MICROSCOPES IN BIOMEDICAL RESEARCH

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Today it is impossible to imagine scientific activity of a person without using a microscope. The invention of the microscope, which is so important for all science, is primarily due to the influence of the developmen of optics. And no matter how a microscope is called - a light, digital, video microscope, photomicroscope, laser scanning microscope, image analyzer - it will be based on a basic light microscope, the principle of which was developed by Levinguk, Newton, Karl Zeiss, Ernst Abbe. Since 1866, Carl Zeiss, together with the professor of physics at the University of Jena, Ernst Abbe, began to work on improving the design of the microscope. For several years of research, Zeiss and Abbe discovered the condition of the Abbe sinuses. Zeiss workshop received a unique technology. In biology and medicine, Carl Zeiss Microscopy is a leading developer and supplier of

microscopy solutions. For 170 years, Carl Zeiss Microscopy has played an important role in finding answers to the questions facing society: from solving environmental problems to better understanding of neural disorders, oncological processes, or the behavior of infectious agents.

SPATIAL STRUCTURE OF ACTH- (7-10)-PGP MOLECULES

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The spatial structure of ACTH-(7-10)-PGP molecule has been investigated using theoretical conformational analysis method. Amino acid sequence of the N-terminal tetrapeptide fragment of Phe-Arg-Trp-Gly-Pro-Gly-Pro molecule conforms to the fragment 7-10 of ACTH hormone. As peptides, which in their nootropic and neuroprotective activity would not be inferior to Semax, various fragments of ACTH: ACTH-(7-10)-PGP, ACTH-(4-10)-PGP, ACTH-(6-10)-PGP, ACTH-(5-7)-PGP were tested. These peptides not only exhibited nootropic andanxiolytic activity, but also increased the viability of cultured glial cells obtained from the cortex of the cerebral hemispheres of rats with ischemic brain damage. Spatial structure of the molecule has been investigated by method of theoretical conformational analysis. It is shown that the spatial structure of heptapeptide molecule can be presented by 8 low-energy forms of the main chain. The low–energy conformations of this molecule, the values of dihedral angles of the backbone and side chains of the amino acid residues were founded and the energies of intra- and inter-residual interactions were determined.

The spatial structure of the ACTH- (7-10) -PGP molecule is studied in fragments. At the first stage, the conformational possibilities of the N-terminal tetrapeptide fragment Phe7-Arg8-Trp9-Gly10 and the C-terminal tripeptide fragment Pro11-Gly12-Pro13 were studied. Then

three-dimensional structure of the His6-Phe7-Arg8-Trp9 fragment was calculated based on the low energy conformations of N-acetyl-L-histidine methylamide, N-acetyl-L-phenylalanine methylamide, N-acetyl-L-arginine methylamide and N-acetyl-L-tryptophan methylamide. Some of the over examined 200 structural variants of the tetrapeptide molecule were sterically forbidden, the relative energy of the others was distributed from 0 to 20 kcal / mol. The side chains of Phe7, Arg8 and Trp9 have sufficient conformational freedom in the low-energy structures of the molecule under study and it can be assumed that they can participate in interaction with receptors and with other conformations.

The theoretical conformational analysis of the heptapeptide molecule ACTH- (7-10)-PGP led to such structural organization of the molecule, which does not exclude the realization by the molecule of a whole range of functions requiring strictly specific interactions with various receptors.

COMPARATIVE STUDY OF CONFORMATIONAL BEHAVIOUR OF ANGIOTENSIN CONVERTING ENZIME INHIBITORY TRIPEPTIDES

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Antihypertensive peptides with angiotensin converting enzyme (ACE) inhibitory properties are of research interest due to the high prevalence of hypertension. Angiotensin-converting enzyme plays a critical role in blood pressure control systems as it converts angiotensin I into angiotensin II, leading to the development of hypertension.Some functional foods are derived from natural sources and generally considered safe and hence these have become potential alternatives to synthetic pharmacological drugs. It is shown that two angiotensin converting enzyme (ACE) inhibitory tripeptides,Ile-Gln-Trp (IQW) and

Leu-Lys-Pro (LKP), were previously characterized from egg white protein ovotransferrin. This study tested the blood pressure lowering potential of orally administered IQW and LKP in spontaneously hypertensive rats. These results demonstrate antihypertensive effects of IQW and LKP in vivo and a reduction of circulating Angiotensin II levels, with additional anti-inflammatory and antioxidant effects mediated by IQW. At the present article the conformational properties of two angiotensin converting enzyme (ACE) inhibitory tripeptides LKP and IQW have been investigated by energy calculation method. It is shown that the spatial structure of these tripeptides can be described by set of low-energy conformations that are characterized by different backbone form. The obtained results have shown that the stable conformers of LKP tripeptide have tendency adopt a beta-strand structure, but the stable conformers of IQW tripeptide prefer to form a fully folded quasi-cyclic structure. Calculations produced the values of all dihedral angles of the backbone and side chains of the optimal conformations as well as intra- and inter-residue interactions energies.The determination of difference in conformational preference of LKP and IQW tripeptides expects the different mechanism of the action of these molecules. The conformational analysis helped reveal a number of special features of spatial arrangement of these drug-based tripeptides, which may be useful as a base for a directed search and synthesis of their more effective structural analogs.

THREE-DIMENSIONAL STRUCTURE OF EXORPHIN B5 MOLECULE

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The regulatory peptides, first discovered in the second half of the twentieth century, are actively studied by both physiologists and pharmacologists, since the area of peptide biological activity is extremely wide. They are one of the main links that unite three main

regulatory systems of the body - the nervous, endocrine and immune.Opioid peptides are currently considered the most studied group of peptide signaling substances. Opium causes pain relief, sedation and sleep, as well as the euphoric state and a number of vegetative reactions. Opioid peptides are of animal and plant origin. We have investigated the structural and functional organizations of a number of opioid peptides, and this work is a continuation of our previous studies.

The conformational possibilities of the exorphin B5 molecule were studied by the theoretical conformational analysis method. The conformational potential energy of the system was chosen as the sum of the contributions of non-valent, electrostatic and torsional interactions and the energy of hydrogen bonds. The low-energy conformations of the molecule, the values of the dihedral angles of the main and side chains of amino acid residues were found, the energy of intra-and inter-residual interactions was estimated.

The study of the spatial structure of the molecule of exorphin B5 shows that conformational freedom is possible around the dihedral angle $\chi 1$ of the residues Tyr1 and Trp4. Therefore the side chains of these residues can easily interact with other molecules and receptors. The molecules of exorphin B4 and exorphin B5 have almost identical low-energy conformations, the positions of the side chains of Tyr1 and Trp4 residues in the space coincide for both molecules.

Thus, the theoretical conformational analysis of the molecules of exorphin B4 and exorphin B5 led to such structural organizations of molecules that do not exclude the realization by the molecules of a number of various functions that require strictly specific interactions with various receptors.

THE TEMPERATURE DEPENDENCE OF INTRINSIC VISCOSITY OF AGAROSE`S LIQUID SOLUTIONS

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It`s kwon that, viscosity is the main parameter which is determine the structure of liquid solutions, characterized the force of friction between molecules in systems. High molecular compounds have a specific properties and also they have high viscosity than low molecular compounds. At the same time viscosity depends on the flow rate of liquid, molecular mass of polymer in such systems and the dependence on concentration is described in nonlinear expressions.

According to the existing imaginations in the solutions of macromolecules their long flexibility molecules aretwisted and turned into a statistical flake.The obtaining results show that, the intrinsic viscosity increase as monotonously and the value of Huggins constant decreases with the increasing of temperature. It belongs to the systems which have high critical temperature of solution (HCTS). This dependence is related to the affinity of water to agarose increase with the increasing of temperature interval in agarose- water systems, so the thermodynamic quality improves (second virial coefficient A_2 increase) and the penetration of water into the statistical flake which is created by agarose macromolecule. And this process increases the volume of flake (flake swells more) its resistance to liquid flood and also increases the value of intrinsic viscosity which is determined from the experiment. It is natural that as stated above the quantity which is characterized by the penetration of solvent into statistically flake is a coefficient k degreases monotonously with the increasing of temperature.

In the present work the temperature dependence of the [η] and k` in agarose-water- sodium salt of lemon acid system has been studied. İn the dependence of [η](t ° C) has been observed maximum and in dependence of k`(t ° C) has been observed minimum. It is clear that

the observed extremes are, of course, related to the re-structure of the solution as a result of the various interactions existing directly in the system. It should be noted that Na ions will generate complex with oxygen which is in agarose molecule so hydration will be strengthened and the number of water molecules which is entering inside of flake will be decrease. As a result the flake will get narrow an [η] will be decrease. Huggins constant will be increased accordingly depending on the temperature.

THE PARAMETERS OF VISCOUS FLOW ACTIVATION OF THE SYSTEMS WATER-PEG-LiOHAND THE PARTIAL MOLAR VOLUMES OF POLYETHYLENE GLYCOL IN SOLUTIONS

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It is known that water has a certain structure and this structure depends on external factors (temperature, pressure, soluble substance etc.). When various substances dissolve in water, the new structure differs from the previous structure of water , which differs from water depending on its physical and chemical properties. As water is the basis of living being, it is important to study the structural changes in aqueous solutions.

Here the structural features of water-PEG-LiOH at temperature 293.15-323.15 K and 0-0.001 partial molar concentration of PEQ were investigated by means of methods viscosimetry and pynometres. The dynamic viscosity and density of aqueous solutions were measured observed temperature and concentration interval. Using experimental results, were analyzed dependence of Gibbs energy ($\Delta G_{\eta}^{\neq}$**)** of viscous flow activation, the activation entalpy of viscous flow ($\Delta H_{\eta}^{\neq}$), activation entropy of viscous flow ($\Delta S_{\eta}^{\neq}$) and the partial molar volume

of PEG ($\tilde{V}$) in solution of studied systems in concentration of PEG.

It has been established that the parameters G, S and H increase with increase both PEQconcentration and molar mass. Due to, dependence of viscous flow parameters from concentration it is possible to tell that, in process of increase in concentration of PEG in solution has stronger structure and more structured. partial molar volume of PEG in solution decreases with increase in concentration at the given temperature and the partial molar volume of PEG increase along with the molecular weight increases at the given temperature and concentration. Calculation shows that partial molar volume $\left(\frac{\tilde{V}}{n}\right)_{or}$ of PEG in monomer at this temperature and concentration practically doesn't depend on the molecular mass of PEG. We can described this dependence with the equation

$$\left(\frac{\tilde{V}}{n}\right)_{or} = 1511612{,}1x^2 - 5440{,}5x + 38{,}9$$

It is possible to assume that the volume portion of big sizes associations in space, the fractional share of its separate parts is less than the sum of volume portion of and vise versa. According to model of the two-structured water, water consists of clusters of the different size and clusters of molecules of free liquid which are attached to hydrogen binding.

It is possible to assume that, in the studied of molecules PEG, the collecting water molecules (first of all free molecules of water) by means of hydrogen bindings, form certain size aggregates. With insreasing both concentration and molecular mass of PEG the number of such aggregates increases and their size increases, that leads to more structured solution. Undoubtedly, the structure formed by hydration of ions Li^+ and OH^- in a system water-PEG-LiOH differ from structure of a system water –PEG.

THEORETICAL STUDY OF THYMOMIMETIC PEPTIDE H-LYS-GLU-OH (VILON) AND ITS COMPLEX WITH THE RECEPTOR

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The peptide H-Lys-Glu-OH (vilon) was constructed on the basis of a statistical analysis of the amino acid composition of the preparation Thymalin. The data obtained from the experimental studies show safety of vilon administration and allow to use this preparation for geroprotection, prophylaxis of age pathology, correction of age-related disorders of angiogenesis and immunogenesis, as well as modulating cell proliferation and inhibition carcinogenesis.

The present study of thymomimetic peptide H-Lys-Glu-OH (vilon) has been performed using computer modeling and molecular docking methods. The conformational profiles of this dipeptide were investigated within molecular mechanics framework. The calculation results showed that two types of conformation, folded and extended, are realized for this molecule.The energy and geometrical parameters for the optimal conformations of dipeptide are obtained. The electronic characteristics of these structures were analysed by quantum chemical calculations. The obtained results indicate that the folded structure is more stable in electronic parameters. The optimal structures of vilon were docking onto the T-cell Receptor 4MNH. It was shown that folded structure of vilon complements well a cleft on the surface of the receptor.

These studies provide an improved description of the ligand-receptor interaction for vilon. The proposed complex can be used for construction of pharmacophore model of the ligand-receptor interaction to search for new thymomimetics.

CONFORMATIONAL MOBILITY OF SIDE CHAINS OF THE MOLECULE CYS-ARG-GLU-LYS-ALA

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One of the relevant directions of nanobiotechnology is the research of processes of the operated transport of medicines and diagnostic means which is carried out by means of nanoparticles.

Loaded with molecules of medicinal substance, nanoparticles are capable to deliver chemical compounds directly to the struck cages without significant impact on healthy cells of various bodies and fabrics. In spite of the fact that in the world more than thirty thousand various medicines are registered, search of the connections having pronounced selective effect of action continues to this day, new substances are synthesized, their modified analogs are investigated. The connection consisting of five amino-acid remains - Cys, Arg, Glu, Lys, Ala belongs to number of such medicines used in therapy of tumor cells with use of nanoparticles.

Low-energy conformational conditions of the molecule CREKA were established by method of the theoretical conformational analysis in approach of mechanical model of atom.

STUDYİNG OF STRUCTURAL CHARACTERISTICS IN WATER-POLYETHYLENE GLYCOL-LIOH, NAOH, KOH SYSTEMS BY VISCOSIMETRY ANDPYCNOMETRY METHODS

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It is clear that structure and thermodynamic state of water change while solving different substances in water. This has impact on all of

occuring biological processes. That's way learning effects of biologically substantial substances to water structure is essential. Polyethylene glycol (PEG) is one of such materials. As PEG does not contain toxic characteristics, it is widely used in pharmacology and food industry.

In process, structural characteristics of water-PEG, water-PEG-LiOH, water-PEG-NaOH and water-PEG-KOH systems are investigated with the help of viscosimetry and picnometry methods at 293,15-323,15 K temperature and at 0-0.001 molar portion concentration interval of PEG. Fractions of polyethylene glycol (PEG) with molecular mass 1500 and 6000 are analyzed and concentration of LiOH, NaOH and KOH is taken 0.01 molar portion at water-PEG-LiOH, water-PEG-NaOH, and water-PEG-KOH systems. Viscosity and density of analyzed solutions are measured at given temperature and concentration interval and according to experimental values, activation Gibbs energy ($\Delta G_{\eta}^{\neq}$), activation enthalpy ($\Delta H_{\eta}^{\neq}$), activation entropy ($\Delta S_{\eta}^{\neq}$) of viscous flow, partial molar volume ($\tilde{V}$) of PEG in solution are calculated and dependency on concentration of PEG are investigated properly.

It is defined that, activation parameters of viscous flow($\Delta G_{\eta}^{\neq}$, $\Delta H_{\eta}^{\neq}$, $\Delta S_{\eta}^{\neq}$) increase as the concentration of PEG increases at given temperature for investigated systems. Depending on concentrationof $\Delta G_{\eta}^{\neq}$, $\Delta H_{\eta}^{\neq}$, $\Delta S_{\eta}^{\neq}$, it possible to say that studied systems at given temperature become more structured with increased concentration of PEG. When equal concentration of LiOH, NaOH, and KOH is added to PEG system at given temperature and concentration, value of $\Delta S_{\eta}^{\neq}$ decreases in proper sequence. This shows that when LiOH, NaOH, KOH is added to the water-PEG system, modification of structure by PEG is getting weaker accordingly. This means that LiOH, NaOH, KOH have and destructive influence on PEG system and this effect increases in given sequence. In order to explain this result, hydration process which is generated by electrostatic interaction between ions and

water molecules will be taken as a base. It should be noted that Na^+ in comparison with Li^+ ion, and in comparison with Na^+ ion, K^+ possesses less hydration, it seems, NaOH in comparison with LiOH, KOH in comparison with NaOH have more destructive effect at given temperature and concentration.

It is defined that partial molar volume of PEG ($\tilde{V}$) in solution is inversely proportional with contentration of PEG. It can be stated that volume fraction of big sized associates in space is smaller than volume fraction of separate parts in total and vice versa. According to binary water structure, water consists of different sized clusters which are connected with hydrogen bond and free water molecules between these clusters. According to dependency of partial molar volume on concentration, it can be assumed that PEG molecules first bond with free water molecules by hydrogen bond. As concentration increases, partial molar volume of PEG in solution increases in final. This shows that solution passes more modified structure as concentration increases.

Thus, according to both activation entropy of viscous flow and dependency of partial molar volume of PEG in solution on concentration, it can be stated that PEG have and structuring effect on both water and water-LiOH, water-NaOH, water-KOH systems, however, presence of LiOH, NaOH, KOH accordingly weakens structuring effect of PEG. This is related to the destructive effect of LiOH, NaOH, KOH accordingly to water structure.

VISCOZYMETRIC STUDY OF AQUEOUS SOLUTIONS LiOH, NaOH and KOH

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In living organisms, there are Li^+, Na^+, K^+ and OH^- ions, and these ions play an important role in biological processes occurring here. Although the LiOH, NaOH, and KOH have a wide range of

applications, the properties of viscous flow and volume of aqueous solutions have been studied less frequently. The analysis of scientific literature shows that there is a need to investigate the structural properties of LiOH, NaOH and KOH in the aqueous solutions and to study the effects of these bases on water structure.

Here, structural properties of LiOH, NaOH and KOH in the range of 283, 15-333,15 K and 0-0,07 partial molar concentration were investigated by viscosimetry and pynometry methods. Dynamic viscosity and density of aqueous solutions were measured in the observed temperature and concentration range. Using experimental results, dependence of viscous flow activation of Gibbs energy ($\Delta G_{\eta}^{\neq}$), viscous flow activation of enthalpy ($\Delta H_{\eta}^{\neq}$), viscous flow activation of entropy ($\Delta S_{\eta}^{\neq}$), and parsial molar volumes ($\tilde{V}$) of LiOH, NaOH and KOH of investigated solution on concentration was analyzed.

It has been determined that increases for the aqueous solution of all three bases $\Delta G_{\eta}^{\neq}$ with increased concentration $\Delta S_{\eta}^{\neq}$ decreases, $\Delta H_{\eta}^{\neq}$ is increased for the solution of LiOH and NaOH, while decreasing for the KOH solution. The reduction of $\Delta S_{\eta}^{\neq}$ for the aqueous solution of all three bases with increasing concentration indicates that these bases destroy the solution of the solution and comparison of $\Delta S_{\eta}^{\neq}$ values shows that KOH has a more destructive effect on water structure than NaOH, and NaOH has a more destructive effect on water structure than LiOH. We suppose that, this is due to the hydration energy of Li^{+}, Na^{+} and K^{+} ions.

When the soluble solids are dissolved in water, a new solution is formed which results in a change in the volume of the solution relative to the water. One of the parameters that characterize the volume properties of the solution is the parsial molar volume of the components. It has been established that for the aqueous solution of all three bases in the observed concentration interval $\tilde{V}$ increases by increases concentration at the taken temperature, as well as in the

solution at 293.15 K, the parsial molar volume of LiOH is negative up to the concentration $x \approx 0.03$, the parsial molar volume of NaOH is negative up to the $x \approx 0.02$ value. With the increase in concentration, the molar concentration of partial molar volume increase. With the increase in concentration, the partial molar volume of bases increase in solution, it can be explained by the relative structure of the solvent is more distorted.

An electric field is formed around each ion in the water and the intensity of this area decreases sharply with the increase in distance. Water molecules in this area are oriented around the ion. As a result, the volume of water molecules around the ion is smaller than the volume they hold in the water phase. This compaction effect is called electrostriction; all ions are formed electrostriction in aqueous solutions. Obviously, the electrostriction effect depends on the surface charge density of the ion. Thus, the electrostriction effect of the small ions with large surface load density will be stronger than the electrostriction effect created by large ions with smaller surface densities. As the surface loads of the Li^+, Na^+ and K^+ ions are reduced in consistency, the intensity of the electric field generated near the ions and the electrostration effects of the solutions decrease in sequence. Li^+ and Na^+, also OH^- are monovalent ions. Li^+ and Na^+ ions have very small dimensions and In the water, a strong electric field is formed around these ions. Therefore, the electrostatic effect of these ions is also strong. As a result, the volume of water molecules around these ions is much smaller than the volume they hold in the water phase. We suppose that the electrostriction effects created by Li^+ and Na^+ are so great, in small concentrations compensates for the ions themselves increase of volume.

FE/PD BIMETALLIC NANOPARTICLES IN WATER REMEDIATION AND NITRATES TREATMENT

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In this paper bimetallic nanoparticles Fe/Pd were synthesized in the presence of surface-active substance medium by borohydride reduction method under deoxygenated conditions. Bimetallic nanoparticles characterization was performed by XRD, SEM techniques. It was found, that in the presence of sodium oleate stabilizer was produced stable, well-dispersed bimetallic nanoparticle solution. SEM pictures have shown that the particle size for iron nanoparticles is 40-80 nm, but for Fe/Pd bimetallic nanoparticles - 20-30 nm.

The purpose of this work was to investigate the effectiveness of Fe/Pd bimetallic nanoparticles in the remediation of polluted water by nitrates. The Fe/Pd bimetallic nanoparticles were synthesized in different weight ratio to fix the optimal percentage of Pd for nitrate reduction. Also the best concentration of Fe/Pd for nitrates removal was investigated. During 15 minute of tests nitrates concentration was analyzed in ion chromatography.

INTERACTION OF PROTEIN AND STARCH MOLECULES WITH NANOPARTICLES

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The interaction of nanoparticles with biological molecules is the basis of their biological reactivity. During this interaction, are formed nanoparticles – bimolecular complexes with new properties. Into the

biological environment the surface of nanoparticles gets coated with various biomolecules, forming so called corona. In these studies was determinated the possibility frmation of corona on the surafce of nanoparticles by the starch and protein molecules. The results of experiments show that forminq corona depends on the consentrations ob biomolecules and types of nanoparticles. In these experiments with starch and egg albumin, a decrease in fluorescence intensity was observed. The degree of decreasing depends on the starch concentration. In high concentrations it may be due to thicknes of starch corona. But in case of protein (egg albumin) the decrease in fluorescence intensity depends on the types and surface characteristics of nanoparticles.

BOUNDARY EFFECTS IN POLYMER COMPOSITES - POWERED CERAMICS

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The paper presents the results of studies of the piezoelectric properties of composites based on multicomponent piezoceramics and fluorine-containing polar polymers.

THE REOLOGICAL PROPERTIES OF LIQUID SOLUTIONS OF PVP

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As it known high molecular compounds have high viscosity than low molecular compounds depending on the temperature and consentration. In present solutions of high molecule compounds long

flexible macromolecules collapses into a ball of varying degrees permeable to solvents. In the present work the temperature dependence of the intrinsic viscosity and Huggins constant of liquid solutions of PVPwas investigated.The dependence of k`(t) increase monotonously with the increasing of temperature. The obtaining results show that, the intrinsic viscosity decrease as monotonously and the value of Huggins constant increase with the increasing of temperature. It belongs to the systems which have low critical temperature of solution (LCTS).The clews squeeze and the size of clews decrease and respectively intrinsic viscosity decrease too. But the huggins constant increase with the increasing of second virial coefficient. The different parts of macromolecules move at different speeds at a certain price of laminar flow. Consequently macromolecule is affected by pair forces which are exposed them to rotate in flow. During the rotation of macromolecules in flow the segments of macromolecules will be rubbed with the molecules of the solution. At the result the viscosity of solution will be increase than solvent`s viscosity.

A SIMPLE EXPERIMENT FOR PROVING GREEN HOUSE EFFECT

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The simplest theoretical basis is proposed for direct proving or not green-house effect. It is hypothesized that a colder object cannot increase temperature of a warmer, by only radiation. A chip experimental set up is described.

Condensed Matter Physics

SPECIFIC HEAT AND MAGNETIZATION OF THE FERMI GAS IN SEMICONDUCTOR NANOTUBE WITH SPIN-ORBITAL RASHBA INTERACTION

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The thermodynamic properties of an ideal Fermi gas with Rasba spin-orbital interaction in GaN nanotube in the presence of magnetic field is investigated. From solution of Schredinger equation by means of effective mass approximation the spectrum and wave functions of an electrons and holes are obtained analytically. Using this spectrum the specific heat and magnetization are calculated. The radius of the nanotube and Rashba parameter are considered as an additional variables.Aninterplay of Rashba spin-orbital interaction, magnetic field and temperature is discussed.

At low magnetic fields the dependence of specific heat on temperature has an peak-like behavior.The Rasba interaction shifts this peak to the side of lower temperatures.It is found also that the Rasba interaction gives an essential contribution to magnetization at low temperatures and low magnetic fields. Numerical results are presented.

MANUFACTURE OF FILM RESISTANCE

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The metals with high volumetric resistivity have large positive temperature coefficient. However the small size of grains and ghettoriration of gases in thin films results to high concentration of

defects and disseminating centers. The conductivity of such structure is described by the formula of Mettisons.

$$\rho = \rho_o(T) + \rho_r ,$$

Were, $\rho_0(T)$ - is member appropriate electron-phonon dispersion, connected with temperature fluctuations of a lattice, and ρ_r - is residual resistance not dependent on temperature, which determined by dispersion on defects. Temperature coefficient is determined by expression

$$\alpha = \frac{1}{\rho}\frac{\partial \rho}{\partial T} = \frac{\partial \rho_o}{\partial T}\left(\frac{1}{\rho_o + \rho_r}\right)$$

The expression is a constant and represents derivative, which determine the temperature dependence of expression member for volumetric resistivity. For manufacturing of nickel-chromium films were used an alloy 80% Ni, and 20% Cr, which has higher resistivity, than chromium, and it's temperature coefficient close to zero. Glories sprayed from wolfram strings at temperature of ~1500^0S. There is a problem at alloying of evaporated material from wolfram. The change of structure is rather essential during evaporation owing to various pressure of components stream. This problem is aggravated also by that the resistivity is increased by change of nickel concentration from zero up to 20%. The solid solution of chromium can be formed in system and the relation of evaporation speeds should follow the Raule law [9].

$$\frac{\mathrm{j_{Cr}}}{\mathrm{j_{Ni}}} = \frac{W_{Cr}}{W_{Ni}}\frac{P_{Cr}}{P_{Ni}}\left(\frac{M_{Cr}}{M_{Ni}}\right)^{1/2}$$

Where, j- is vacuum evaporation speed in terms of weight on area for a time unit; W– is weight contents of components in an alloy (%); P – is pressure of component stream at temperature of T (^{0}K); M – is atom weight of a component. It's results to expression for dependence on temperature, for an alloy 80% Ni -20% Cr;

$$\lg\left(\frac{j_{Cr}}{j_{Ni}}\right) = \frac{900}{T} - 0.58$$

Vacuum evaporation of a film show in general smaller enrichment of chromium, and only in one case the increase of the chromium contents with temperature is observed. By this deviation many factors, for example alloying or primary oxidation of chromium can promote. Partial oxidation of chromium and capture of gas, obviously, play the large role, as density of films varies from 3,5 g/cm^3 at 8000 Å (density of nickel-chromium is 8,2 g/cm^3, and Cr_2O_3-5,2 g/cm^3).

One of the main fabrication stages of film resistances is bringing resistance value to face value.

Change of film thickness provides possibility of variation of resistance value without changing the basic properties of a material. However often resistivity and temperature coefficient of resistance depend on film thickness, thus making easy alteration of surface resistivity without changing basic properties of the material difficult. Therefore it's necessary to compare different films by their resistivity values.

To keep high surface resistivity of thicker films is important to get films with high resistivity. Resistivity can be changed by oxidation of boundaries of grains in the film or by annealing.

To make nickel-chromium films an alloy of 80% Ni and 20% Cr has been used as it has higher resistivity than chromium and its temperature coefficient is close to zero.

MAGNETIC MOMENT OF THE LATTICE OF NON-INTERACTING DILUTED MAGNETIC SEMICONDUCTOR QUANTUM RING

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In the present work, we investigate the magnetic properties of the non- interacting diluted magnetic semiconductor (DMS) quantum ring lattices by using the 2D rotator model. We take into account the effect of the exchange interaction and the Zeeman term on the magnetic moment. For this purpose, we derive the exact analytic expression for the single-particle partition function und used it to determine the magnetic moment. We show that the positions of compensation points (points at which the magnetization vanishes at fixed values of the magnetic field strength)) in the temperature scale are very sensitive to changes in the Mn concentrations.

ENERGY RADIATION IN IMPURETY SEMICONDUCTORS IN AN EXTERNALELECTRIC FIELD

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Current ostillation in spending environments arise at availability external influences. It can take place, if the spending environment is in an external electric floor, in external electric and magnetic fields and even at availability of a gradient of temperature in the environment. In semiconductors (electronic type, electronically-

hole type) charge carriers from external influences are accelerated or slowed down impurity by the centers and consequently distribution of a charge in the semiconductor deviates equilibrium values and thus inside of the semiconductor there are areas with different values of an electric field. These sites move on all images and then there are fluctuations of a current in-external circuit. In semiconductors with two types of carriers of a charge (electrons and holes) deep traps, construct the theory of external instability by calculation of an impedance of an image. At negative value of an actual part of impedance frequencies of fluctuation of a current, value of an external electric field are calculated. We shall find some areas of external instability of existence of current fluctuation in semiconductors with deep traps with the certain concentration. Concentration of deep carriers changes a sign on an electric charge at availability recombination and generation of free carriers. Some values of a parity of free charge carriers in which are certain, fluctuations of a current appear in-external circuit.

The analysis of all results in a high-frequency limit leads to a following conclusion. In a high-frequency limit (frequency it is much more than fluctuation of a current than all characteristic frequencies entering into theories) is possible supervision of several areas of instability. These areas essentially depend on the value of concentration of carriers of a current, from value of an external electric field, from frequency of fluctuations. Dependence of these observable areas of instability on factors intentions proves only at a high level of injection.Conditions for occurrence of these fluctuations depend on different parities of equilibrium concentration of carriers and different values of an external constant electric field and slightly depend on injection factors. At very greater levels of injection of a occurrence condition of these fluctuations depend strongly on injection factors.

BACKWARD SECOND HARMONIC WAVE IN REGULAR DOMAIN STRUCTURES

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Complex amplitude of backward second harmonic wave has been theoretically studied by sequential generation of second and third harmonics within regular domain structures (RDS) with quadratic nonlinearity. It has been found analytical expression for efficiency of second harmonic generation by approach of constant intensity approximation. Diagrammatically has been analyzed conversion efficiency of frequency into the second and third harmonics by various analytical approximations. During counter wave interaction intensity of backward second harmonic swings up at low intensity of entered second harmonic wave. Moreover reducing the ratio of nonlinear coefficients like β_3/β_2 provides increasing of conversion efficiency of frequency into second harmonic, but efficiency of transferring of frequency into third harmonic will be decreased.

Observed behavior of nonlinear interaction has been explained by rivalling process between second and third harmonic waves.

VARIATION METHODS OF MEASURING OF DIELECTRIC PARAMETERS

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Under studying the structure of liquids and the nature of molecular processes in them are necessary to rely on a set of experimental data from various physical studies on such macroscopic characteristics of a substance that are inextricably linked with its molecular parameters and illustrate the structure and movement of

molecules, the nature and mechanism of specific intermolecular interactions.

The application of the new variational method to the study of liquids and solutions allowed by evaluating the behavior of the frequency and temperature dependences of the dielectric constant and dielectric loss to determine the value of dipole moments (μ) of polar molecules, polarizability (α), relaxation times (F), orientation patterns of dipoles and a number of other important molecular characteristics of a substance. Dipole moments, relaxation times, the distribution parameter of the relaxation time, the contributions of the main and additional dispersion regions, and the mechanisms responsible for the existence of various dispersion regions were calculated on the base of experimental data. All the experimental data on the dielectric properties and relaxation characteristics of the objects under study were obtained for the first time.

OPTIMIZATION OF THE DIOD-PUMPED SOLID-STATE LASER PARAMETERS OF A SOLID-STATE Nd: YAG WITH TRANSVERSE PUMPING BY LASER DIODE

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Diode-pumped solid-state lasers (DPSSLs) are solid-state lasers made by pumping a solid gain medium, for example, a ruby or a neodymium-doped YAG crystal, with a laser diode. The transition to high-power diode lasers instead of low-efficiency lasers emitting in a wide spectral range, having low reliability of pump lamps, makes it possible to create powerful reliable solid-state lasers of compact dimensions and with high efficiency.

Diode-pumped solid-state lasers have a very wide range of applications. Indeed, they are used in all of the areas mentioned in the article on laser applications [1].

Fig.1. The design of the DPSSLs

The efficiency of the output characteristics of a DPSSLs depends to a large extent on the location of the diode laser matrices around the active element, the efficiency of absorption of the pump radiation by the active element, the heat removal efficiency of the diode laser, and the active element. This DPSSLs is designed for a five-beam transverse pumping scheme.

Table 1.Characteristics of the DPSSLs.

Pumping power	Output energy	Pulse duration
30kW	>1 J	250 μs
Dimensions of the DPSSLs	Intensity	Wavelength
140x133x91 cm.	0.2J/cm2	1064nm

When creating this laser, our group faced the following problems:

1. Due to the uneven distribution of the cooling liquid, a temperature difference has arisen in different heat exchangers of the pump diode. Because of what the wavelength shift occurred, which led to uneven pumping of the active element.

2. When using the standard scheme of symmetric pumping of the active element on five sides [2] , the generation profile is unevenly

measured. The middle of the beam is much stronger than the edges.

The above problems were solved in the course of our work. Detailed description in the presentation.

[1] https://www.rp-photonics.com/diode_pumped_lasers.html
[2] И.В. Глухих, 1 С.А. Димаков, 2 Р.Ф. Курунов, 1 С.С. Поликарпов, 1 С.В. Фролов Мощные твердотельные лазеры на Nd:YAG с поперечной диодной накачкой и улучшенным качеством излучения \ Журнал техниче-ской физики, 2011, том 81, вып. 8

ENERGY OF ULTRA SHORT PULSES IN METAMATERIALS

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Nonstationary interaction between forward high intensity pump and idler waves with backward ultra short pulses in metamaterials is studied in the second order dispersion theory. We obtained analytic expression for the energy of backward signal wave. An influence of o group velocity mismatch (GVM) as well as the group velocity dispersion (GVD) on the energy of a signal wave is studied. Energy of signal wave has a pronounced maximum depending on the length of metamaterial. Variation in characteristic lengths as GVM and GVD leads to the change in optimum length of metamaterial at which energy of a signal wave is maximum. It was obtained that maximum of energy of conversion is reached not at group phase matching, but at the definite characteristic lengths of GVM and GVD. For the given ratio maxima of reduced energy of signal wave displaces toward greater values of phase mismatch parameter with increase in GVM.

EFFECT OF THE ENERGY SPECTRUM NONPARABOLICITY ON THE ENTROPY OF A COMPLEX SHAPE QUANTUM WELL

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Taking into account the energy spectrum nonparabolicity of a two-dimensional electron gas leads to a density of states linear dependence on energy (unlike the parabolic spectrum), which affects on the thermodynamic and kinetic characteristics. In this work the entropy of a two-dimensional electron gas as a function of the complex shape quantum well parameters, a two-dimensional concentration of charge carriers, temperature, and band gap are studied. The dispersion law is described by the kane model in a two-band approximation. The cases of degenerate and nondegenerate electron gas are considered. It is shown that entropy is a step function of a charge carriers two-dimensional concentration, as well as a quantum well parameters - width and potential. With a decrease in the band gap, the dependence of the entropy on the two-dimensional concentration becomes monotonic. In the case of a degenerate electron gas, the entropy is proportional to the density of states. Taking into account the nonparabolicity of the energy spectrum leads to a significant increase the entropy compared with the parabolic energy band because the density of states increases with energy. Electrons are in bound states and their ordering grows. In the limiting case, the results for a well of a complex shape are obtained that are valid for a rectangular and quadratic potential well. The results obtained in the work can be used to interpret existing experimental data.

STATISTICS OF SYSTEMS WITH CORRELATED STATES

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In most instances, correlation between states of a system is expected to decrease at long times because of the inevitable slow leakage to the environment. Manner of this decay can be somewhat surprising, besides the exponential decay of entanglement, in optical and atomic systems it has been experimentally confirmed that entanglement as a global property may abruptly terminate in a finite time. This phenomenon can occur when the environment is quantum, classical, Markovian, and non-Markovian. In the present work, we consider system with correlated states dynamics in state space. A set of the system states is considered as a continuum in state space, in Eulerian variables a generalized continuity equation for correlation function is written down. The probability density, correlation function and metrics of state parameters and time at fixed state-space locations we take as variable quantities and determine fields of these quantities. Simple expressions connecting the quantities are derived.We find that the density of probabilities, correlation function (entropy, as a measure of uncertainty), and time of states of the correlated objects have hierarchical structures with respect to the parameters. By the model, some phenomena (non-locality, entanglement, etc.) are explained.

THE DESTRUCTION OF TRANSPARENT DIELECTRICS UNDER THE ACTION OF LASER RADIATION

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At present, the destruction of materials attracts great attention of researchers, and it considers both the specifics of the interaction of intense electromagnetic radiation and matter, as well as applied issues in connection with the development of new technological operations, improvements in laser technology and the creation of protection against optical damage to equipment. In this connection, the question of the behavior of a solid medium under the influence of a powerful laser beam inevitably arises. Already in the lasers themselves, active elements, mirrors of the optical resonator are exposed to laser radiation; in optical systems, the presence of lenses, light filters, etc. cannot be ignored.

Experimentally investigated the destruction of transparent dielectrics under the action of laser radiation. As an optical excitation, neodymium lasers ($\lambda = 1{,}06\,\mu m$) operating on a single-pulse ($\Delta t = 3\cdot 10^{-9}$ s, W = 1.2×10^{7} W/cm^2) and usual ($\Delta t = 5\cdot 10^{-4}$ s, W = 0.1×10^{2} W/cm^2) lasing modes were used. It was found that when samples of polymethylmethacrylate (PMMA) are exposed to laser radiation in them, when energy flows in a pulse exceeding certain critical values, visible damage occurs. There is a significant difference in the nature of the damage with the usual and giant pulses, the pulses of a conventional laser cause less damage to the material than a million times more pulses of a nanosecond laser. To obtain information on the kinetics of the development of destruction, we investigated the effect of the intensity of the feeding beam on the magnitude and temporal character of the light pulse transmitted through the sample. Direct experiments have shown that the formation of a destruction region

occurs during the duration of the light pulse and the centers of destruction occur on microinhomogeneities that have a lot of starting material. The appearance of paramagnetic centers in PMMA exposed to laser radiation has been detected. It is assumed that the observed paramagnetic centers are products of a peculiar decomposition of polymers under the action of high-power laser radiation and high local temperatures developing in cracks. As such products one can imagine, for example, carbonation products or molecular ions.

FOLLOWING ELECTRON IMPACT EXCITATION OF SINGLE (93Np, 94Pu, 95Am, 96Cm, 97Bk, 98Cf) ATOMS O SUBHELL IONIZATION CROSS SECTIONS BY USING LOTZ'S EQUATIONS

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O shell and five Oi subshells ionization cross sections σO and σOi following electron impact on (93Np, 94Pu, 95Am, 96Cm, 97Bk, 98Cf) atoms calculated. By using Lotz's equation in Matlab ionization cross section values obtained for 12 electron impact energy values in first ionization energy to five times ionization energy range for each atom. Lotz's parameters and special commands used for each ionization cross sections calculations. Starting all most from ionization threshold values; ionization cross sections are increasing rapidly with electron impact energy Eo. For higher Eo values this increments getting smaller for every Oi subshells. For smaller Eo energy close to threshold all ionization cross sections decrease. For a fixed electron impact energy while Z value increases from $93 \leq Z \leq 98$; ionization cross sections decrease with Z. Results may help to understand similar _ndings which obtained from other electron impact excitation of Oi subshells ionization cross sections studies for similar size single atoms.

FOLLOWING ELECTRON IMPACT EXCITATION OF SINGLE (99Es, 100Fm, 101Md, 102No, 103Lr, 104Rf) TRANSURANIC ATOMS O SUBHELL IONIZATION CROSS SECTIONS BY USING LOTZ'S EQUATIONS

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O shell and five Oi subshells ionization cross sections σO and σOi(i = 1,..,.5) following electron impact on (99Es, 100Fm, 101Md, 102No, 103Lr, 104Rf) atoms calculated. By using Lotz's equation in Matlab ionization cross section values obtained for 12 electron impact energy values in _rst ionization energy to five times ionization energy range for each atom. Lotz's parameters and special commands used for each ionization cross sections calculations. Starting all most from ionization threshold values; ionization cross sections are increasing rapidly with electron impact energy Eo. For higher Eo values this increments getting smaller for every Oi subshells. For smaller Eo energy close to threshold all ionization cross sections decrease. For a fixed electron impact energy while Z value increases from $99 \leq Z \leq 104$; ionization cross sections decrease with Z. Results may help to understand similar findings which obtained from other electron impact excitation of Oi subshells ionization cross sections studies for similar size single atoms.

Theoretical Physics (*posters*)

ELECTRON GAS IN QUANTUM FILM WITH SPIN-ORBITAL RASHBA INTERACTION

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The work of most electronic devices is based on controlling the movement of an electron using electromagnetic fields acting on the electron charge. The possibility of influencing an electron, not only as a charged particle, but also as a particle with a spin, gave rise to a new area of research, spintronics. The spin, and the spin-orbit interaction, has a relativistic nature, and therefore the Hamiltonian for the spin-orbit interaction can be obtained from the relativistic Dirac equation. The corresponding additives to the Hamiltonian are distinguished in two types: in the form of Rashba and in the form of Dresselhaus.

In the present work the electron gas in a quantum film is considered taking into account the Rashba interaction in the presence of a longitudinal magnetic field. The Rashba Hamiltonian can be considered as an effective magnetic field. In the absence of a magnetic field, the Rashba term leads to infinite momentum degeneracy of ground state in the energy spectrum. The longitudinal magnetic field removes this degeneration. In this case, the effective electron mass becomes anisotropic.

NUCLEONS FORM-FACTORS IN ISOSPIN MEDIUM IN THE HOLOGRAPHIC QCD

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In this work, the electromagnetic form-factors of nucleons are studied in the framework of hard wall model of holographic QCD. In this work, the constant isospin background field is included for nucleons which are interacted with this kind of field. The interaction Lagrangian of nucleons which have interaction with constant isospin field is written in the bulk of Anti-de-Sitter space. By using this Lagrangian the equation of motion in 5D spaces for fermion field was found. Thus, the solution to this equation, which is called the profile function, was found. It was found that in case of interaction with isospin field the mass spectrum of nucleons splits into two series. It was observed the effective mass in the first series decreasing, while it increasing in the second one. The profile function for a photon in AdS space was found. This profile function is exactly the same with one as in the vacuum. The Lagrangian for the interaction of gauge fields describing photon with the nucleon fields was written in the bulk of AdS space. By using this Lagrangian in the isospin field the electromagnetic form-factors of nucleons was calculated. It was determined that form-factor of nucleons, which is one curve in the vacuum, is two different graphics in isospin field.

PHOTOMETRIC AND SPECTRAL REDSHIFTS IN THE STAR CH CYGNI

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Symbiotic stars are a small subset of binaries that consists of a small, dense white dwarf and a cool red, giant star. The material which is the outcome of the pulsation of red giant formulates a ring around the white dwarf, and an outer layer around the binary. One of the most prominent members of symbiotic stars is the star CH Cyg. CH Cyg is known for its activity, which started in 1960s. CH Cyg has been rather explored due to its activity, and, as of now, more than 350 articles have been published about it in SIMBAD database.

Spectral observations of the symbiotic star CH Cyg have been conducted in Shamaxi Astrophysical Observatory, and between 5650 and 756 days of periodic changes in the velocity of the X-ray emissions in the spectrum of the star has been found out.

On July 10^{th}, 2018, photometric and spectral observations of the symbiotic star CH Cyg were conducted during the same night in Shamaxi Astrophysical Observatory. The telescope Zeiss-600 was used for photometric observations, while 2 meters long telescope with contemporary CCD light receivers was used for spectral ones. Obtained digital observation materials were executed and analyzed via DECH and MaxImDL softwares.

The continuous length of photometric observations was 12 minutes. During this time, nearly 100 images were taken providing the exposition of 5 seconds. Each 5 consecutive images were averaged in order to increase the accuracy of the measurements.

To reveal the redshifts in the spectrum of the star, 9 consecutive spectrums of the symbiotic star were attained using 2 meters long telescope providing the exposition of 300 seconds.

As it can be observed by looking at the pictorial, the changes in the flux and equivalent widths demonstrate a similar trend. As the

brightness of the star decreases, the equivalent widths of hydrogen lines also decrease. It occurs especially along the line H_a.

USING INTERACTIVE COMPUTER MODELS IN THE STUDY OF PHYSICS AS A MEANS OF MOTIVATION OF STUDENTS

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An article provides the use of modern computer technologies and interactive teaching methods, along with traditional training methods, to enhance the motivation of students during the teaching of physics.

To fully understanding the subject of teaching physics in the school involves additional laboratory works. But, conducting experiments in physics classes at schools are often tough, either lack of time, or lack of material and technical equipment. It is also difficult to attract the attention of all students by conducting an experiment. Development of computer technology significantly increased the effectiveness of the "experimental" part of the physics lessons. The use of computers converts lessons into a realistic creative process.

By using interactive lessons gives opportunity to select important parts of the lessons, to distinguish secondary factors, to define patterns, to repeatedly carry out experiments with changing parameters, to record results. Such experiments are carried out with a variety of physics laws, events and processes which belongs to computer related models. In addition, it is possible to perform much more experiments with help of the computer. Working with models opens great opportunities for the students to understand the subject, they are not only viewers , but also an active participant in experiments.

Currently, interactive lessons are used in the following forms of teaching physics:

Computer models - imitation of the idealized situations in any physical laws, events, processes or issues on the computer screen.

Virtual Laboratories - the use of more modern computer software that has a wide access to the user's computer models.

The level of motivation is an indicator of the effectiveness of the teaching process. For this reason, conducting interactive lessons using modern computer technologies is a factor that enhances students' motivation for learning physics.

In recent years, the majority of schools have computer classrooms with access to modern computer equipments and Internet, which gives the opportunity to organize and conduct physics lessons according to the level of twenty-first century.

According to our research, it is possible to increase students' motivation to study physics by creating problematic situations at different stages of the lesson and using computer tests, various training programs, internet resources. At the same time, it is also important to use theoretical, general and statistical pedagogical methods.

We consider that, one of the main missions of the teacher is to create students' interest to the lesson which he/she taught. New topics should be based on previous lessons, so the new lessons may start with the use of multimedia products, which gives is a productive way to update students' knowledge about last lesson. Such lessons are based on didactic principles such as the principle of personalization of education, the principle of creativity and success, the principle of trust and support.

Students' performance can be further stimulated by the following methods: the student is encouraged to create a successful situation, to discuss the subject not only as a teacher, but also to discuss at an equal level, to create an emotional state, to find out when the student's "own" solutions are correct, when it comes to the place, talk about it and so on. In our opinion, in such lessons, students will try to consider new approaches and solutions when discussing any problem.

ELEMENTS OF PHYSICAL THEORIES IN THE COURSE OF INITIAL PHYSICS

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Physical notions as elements of scientific thinking. When considering the experiment in the physics course, it was stated that the purpose of showing physical experiments is not so much in the application of one or physical equipment to reproduce the phenomena, but in the content of those explanations, which gives Teacher to the students, showing the experience. Despite its elementary character, the course of elementary physics cannot but contain some elements of physical theories.

The First element of the theory when studying physics is the introduction of scientific terms and definitions in the explanations of the experiment. Paying attention to these or those observed phenomena, labeling them always by the same words, we already deal with elements of scientific thinking, with the most initial elements of a physical theory.

Ordinary language, especially conversational, is rarely accurate; Very often words in their meanings are used one instead of the other and do not have exactly certain content. The Scientific language, unlike the colloquial one, does not allow such ambiguity of the meaning of any spoken word. For example, in everyday language we often use the word "weight" with two completely different meanings. Sometimes by this word we understand the force with which the body is attracted to the Earth, and sometimes the property of the body itself, which is the cause of the attraction. This property in physics is defined by the term "mass" of the body, which is manifested not only as grave like, but also as inert. In everyday language the concept of warmth is contrasted with the subjective concept of cold; the last in science is absent. In physics, the term "temperature" is used for the degree of body warming.

However, and in science, for historical reasons, sometimes there is some "confusion" of terminology. An Example of how sometimes the term changes its meaning in the development of science, can be the meaning of the word "force" in terms such as "current", "forces of nature." In The first case the word "force" corresponds to the notion of "quantity", in the second it has an energetic meaning. The possible divergence of the meaning of the word in the ordinary and scientific language can never be overlooked in the Statement of physics. The Teacher should always check how students understand scientific terms and, even more, common words.

Definitions of scientific concepts, with which the fixed content is connected, can be not only separate words, but also whole phrases or sentences. In this case, it is very important not only to understand the merits of the case, but also to express the notion of a grammatically-constructed sentence that transmits the experience-related link between phenomena.

So, for example, when they say, "The conductor passes an electric current, in this phrase students should be clearly aware of what the conductor is, which means the verb to pass in relation to the electric current, which should be implied by the words electric current. This Short phrase contains a very extensive content and is also a certain combination of scientific terms to express the relationship between the facts learned from experience.

SOME PECULIARITIES OF TEACHING OF THE PHYSICAL LAWS IN PHYSICAL COURSE OF SECONDARY SCHOOL

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After gaining independence of our republic, few specialists are busied by solving the problems. One of these problems is the redoing of the content of the physics course. Significant innovations have been made at the installation and the content of the course. One of the

important issues is the accommodation of physics laws in view of the increasing difficulty of topics the physics law in course. Preparatory stage of laws training should be organized at a high level. After explaining the notions which will be used in the law, the teacher should present the physical laws and give examples, facts related to the law.

It is suggested that, when teaching the laws of physics at secondary school, take into co consideration the following factors.

1. Ensure the active participation of students in teaching of laws.
2. When teaching mechanics laws by traditional way, they comment them on the basis of relativistic mechanics.
3. Preference is given to obviousness, practice in teaching.
4. They teach students to tell the truths verbally and prove them mathematically.
5. They give scientific profile to students to find the relationships between laws and assign independent work.
6. After showing some examples of the practical application of the law, students are entrusted to research and the choice of facts.

NUCLEON'S AXIAL CHARGE IN HOLOGRAPHIC QCD

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We study axial vector charge of the nucleons in holographic theory function. For the model we choose hardwall model of bottom-of approach. To describe nucleons we introduce couple of fermion fields in the bulk of Ads space. We get profile functions for fermion fields solving five dimensional equation of motion in the bulk of Ads space. Imposing boundary condition on solution in the infrared limit we get mass spectrum. We introduce couple of gauge fields and compose five dimensional axial vector fields from them. We write in the bulk of Ads space interaction lagrangian between fermion and axial vector fields. Using Ads/CFT correspondence we get expression for the axial vector

factor of nucleons. The value of this arm factor at $Q^2 = 0$ point defines axial vector charge of nucleons. We compare our results which ones obtained other models. Our result id good within agreement which ones obtained field theory.

DEPENDENCE OF THERMODYNAMIC MAGNITUDES ON ASYMMETRICAL QUANTUM WELL PARAMETERS

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Modern techniques allow one to obtain quantum wells with different profiles. The width and potential of quantum wells significantly influences parameters of quantum well based devices.In the present work we investigate an influence of the semi-parabolic quantum well width and potential on entropy and heat capacity. For degenerate two-dimensional electron gas the entropy are determined through the density of electron states at the Fermi level. It has been shown that entropy and heat capacity of the semi-parabolic quantum well oscillates with the well width, which is due to a jump in the density of states. With an increasing the quantum well width, the density of states and the entropy strongly decrease. The oscillation period is dependent on well potential. At the given well width with potential decreasing, the Fermi level decreases, leading to decrease in entropy and heat capacity. Heat capacity according to the Nernst theorem is linear with temperature. These is explained by the fact that heat capacity is determined by the excited electron (with energy near the Fermi level) concentration.

POLARIZATION the HADRONS in NUCLEAR SCATTERING PROCESSES

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Spin effects are important from the point of view of studying the structure of particles, in particular, the problem of the relationship between the spin of the system and the spin of its components and the interaction mechanism of the components. A qualitative description of the polarization of hyperons is explained by the spin-orbit interaction in a scalar field that connects quarks within the hadrons.

At the present time the theoretical and experimental research leads to the conclusion about the essential role of the spin of the particles in the high energy scattering. This makes a basis for the hypothesis about the existence of a non-zero polarization research on the future accelerators will provide information about the structure of the nucleon interaction at large distances.

Polarization of particles scattered from unpolarized particles can occur primarily due to the spin–orbit interaction between the continuum projectile and the target [1]. The filtration of unpolarized hadron beam through a polarized beam of the target will be relatively enriched hadrons with the polarization direction for which the interaction cross section of the smaller, there will be a polarization of the beam in this direction.

In this paper we consider the model results for the polarization effects of hadron-nuclei scattering. The spin-polarization effects are used not only as battle probes for determining the accuracy of the model employed, but also play a critical role in understanding the spin-dependent interactions involved in the collision dynamics.

At sufficiently high energies of the relative motion of the colliding nucleons, we can confine ourselves to the first Born approximation. The scattering amplitude f is elements of the 2 x 2 matrix, which can be expressed in terms of the Pauli matrices σ and the identity matrix E

$$f=gE+(h\sigma). \qquad (1)$$

In (1), the factor *g* corresponds to an interaction independent of spin, and the vector *h* to the interaction causing the reorientation of the spin [2].

Due to the spin dependence of the interaction, the scattering cross section can depend on the polarization of the incident particle and on the polarization of the target. Using the definition of the differential scattering cross section we obtain that

$$\sigma(\theta,\varphi)=\{1+P(\theta)\cos\phi\}\left(|g(\theta)|^2+|h(\theta)|^2\right), \qquad (2)$$

$$P(\theta)=2\frac{\mathrm{Re}(g^{*}h)}{I(\theta)} \qquad (3)$$

In the scattering of unpolarized hadrons on nuclei, polarization of elastically scattered hadrons arises. Since the scattering amplitude contains a term that depends on the orientation of the spin, and a term that does not depend on the spin orientation, the polarization is due to interference between these two scattering parts. Large values of the degree of polarization (the absolute value of the polarization vector is called the degree of polarization) are possible in the case when the interference value is comparable with the scattering cross section.

If polarization measurements were performed as a function of energy, it was found that the sign of the polarization varies between the quasielastic and deep inelastic regions of energy [3]. This is explained by the interference of spin transfer from positive and negative scattering angles. Different polarization signs are associated with positive and negative scattering angles and the polarization can be zero if there is a balance of scattering from both sides.

We assume that the considered scaling property for polarization processes rejects self similarity of the spin structure of the colliding objects, interaction mechanism of their constituents, and process of fragmentation of the polarized constituents in the final state.

ROLE OF PHYSICS IN THE ORGANIZATION OF ECOLOGICAL TRAINING

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Human is a part of nature and linked with it closely. The world is infinite and natural resources are considered to be inexhaustible. However, after a few decades the world faced a very dangerous ecological catastrophe.

What is "ecology"? Ecology (from the Greek word "oikos-home", "logos-science") is a science about the interaction of living organisms and environments. The main concept of ecology is the ecosystem. The "ecosystem" was proposed by A.Tensley in 1935. It is closely linked to environmental education. Enviromental education refers to a process of continuous educational development that focuses on the formation of environmental responsibility among the general environmental culture, the Earth's inhabitants.

Environmental problems have increased so much that is difficult to solve the problem by studying it within the framework of one science. From this point of view, the study of the basics of ecology in the teaching of general education at the elementary schools can be more effective in conjunction with the Physics. Ecology has the opportunity for teaching physics: Interaction with human electromagnetic fields (EMF), intensification of radio communication and radiolocation, expansion of electromagnetic energy utilization for technological operations, etc. The role of school physics course is very great in environmental education problems. It should be noted that, the number and power of EM rays are constantly increasing. In particular, the use of household electronic equipment (mobile phones, computers, microwave ovens and many other household appliances) has reached a very high level. It is important to emphasize the role of physics in the creation of devices and facilities that can be used not only within the region, but also throughout the world to conduct environmental

monitoring. In modern school physics, modern problems of mechanics, molecular physics, electrodynamics, optics, nuclear and nuclear physics are studied. Topics that are mainly taught in nuclear and nuclear physics are more environmentally-oriented. For example, the circulation of radioactive substances, radiation damage to the human body and the living organism, and so on. In this case, a large number of radioactive substances are scattered around the environment, which is extremely harmful to human health. For millions of years, all living things on the Earth have adapted to natural radiation. The surface of the Earth is the source of many irradiation, including γ rays. So, on the Earth's surface, there are natural radioactive elements (uranium, torium, radium, actinium, etc.). Potassium (^{40}K) and carbon (^{14}C), which are of great ecological importance in soil and water, are widely spread.

The role of physics in environmental science is that the students take a step in the field of physics as they begin to study nature and study the physical processes occurring in the world. Within the framework of environmental training, students can learn about the pollution and self-cleaning of the atmosphere, the reduction of the concentration of harmful particles in the atmosphere by scattering and the increase in CO_2 content in the Earth's atmosphere as a result of global warming. Physics is the main object of environmental training. For example, the condition of the Ozone Layer which protects Earth, biological objects from ultraviolet rays, is based on the name of Physics.

Environmental physics can be defined as the response of living organisms to their environment within the framework of the physics of environmental processes and issues.However, it is important to appreciate that the principles and laws of physics are in evidence in many different environments and govern how all species live on the Earth.

DIDACTIC FUNCTION OF PHYSICAL EXPERIMENT IN THE SCHOOL PROGRAM OF PHYSICS

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In the Concept of Modern Education, the teaching of physics is based on experimental testing and theoretical analysis at school. The use of ICT in the educational process in the selection, storage, processing of information allows you to automate processes such as teacher management, design and survey. Currently, there is the possibility of a visual demonstration of a number of complex technical devices, such as: the principle of nuclear power plants, radioactive fragmentation, events and processes occurring in the micro- and macroworlds, microscopes and areas of their application. Events and processes that are difficult to miss are easily accessible using computer technology In the classroom. The effectiveness of ICT use is determined by the systematic and seriousness of the three areas of technical, methodological and organizational interaction. In modern conditions, the use of ICT can be conditionally formulated in three directions (episodic, systematic and synchronous). In the traditional learning process, teachers have quite reasonable goals, but these goals are perceived by students differently. The curriculum is designed to help people develop skills, acquire skills and habits, develop thinking and lead a healthy lifestyle .The following are the benefits of the curriculum in the Concept of Modern Education:

1. The subject curriculum is result-oriented.
2. The subject curriculum is focused on personality.
3. The subject curriculum is developing.
4. The subject curriculum is of advanced character.
5. The subject curriculum is student-oriented.
6. The subject curriculum is an integrative character.

The basis of the educational function of the school physical experiment is to create an idea and the correct direction of activity by

gaining a sense of the event and confidence in it. As a result of established activities, students acquire the ability to observe, autonomy, design, test the scheme and practice. see and draw conclusions from this.

CALCULATION OF KINETIC ENERGIES OF THE ELECTRONS AND POTENTIAL ENERGY OF THE ATOMS WITH OPEN ELECTRONIC SHELLS ON THE BASE OF SLATER-TYPE ATOMIC ORBITALS

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At work, it has been studied the calculation of kinetic energy of electrons and potential energy on opened shell fluor atom. Calculations are taken on the base of Slater-type atomic orbitals. The electronic configuration of fluor atom corresponds six determinant wave functions. These determinant wave functions differ each other by spin quantum numbers of electrons in opened 2p electronic shell. The term of fluor atom and determinant wave functions of this term are discovered. Determinant wave functions are made by atomic orbitals of fluor atom. Atomic orbitals are searched as linear combination of Slater functions of F atom $1s-$, $2s-$, $2p_x-$, $2p_y-$, $2p_z-$, $3s-$, $3p_x-$, $3p_y-$, $3p_z-$. It was found analytical expression of Slater functions. On linear combination, the values of unknown coefficients were found by solving Hartree-Fock-Roothaan equations. It was obtained analytical expressions for kinetic energy and potential energy on opened electronic shell atoms by using known determinant wave functions. These quantities are expressed by one-center overlap, kinetic energy, nuclear attraction and one-center two electronic integrals and coefficient of linear combinations in expression of atomic orbitals. For calculation these integrals are used known analytical expressions in references. According to these expressions, kinetic energy of electrons and potential energy was calculated in fluor atom. Accuracy of calculations is checked on the base of Virial theorem.

COUPLING CONSTANT OF OCTET BARYONS WITH THE VECTOR MESON FROM THE HARDWALL Ads/QCD MODEL

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It was studied interaction between octet baryons with the vector mesons in the framework of the hard wall model of ADS/QCD. It was found profile function for octet baryons in this model. It was determined thar every baryon, which is included into this octet, has different profile function. Also, it was found profile function for vector mesons. It was written interaction lagrajian between gauge fields describing vector mesons and fermion fields in the bulk of Ads space. This lagrajian consist of minimal coupling and magnetic type interaction terms. Using this lagrajian it was calculated coupling constant between baryons from the octet and vector meson, The obtained expressions are integrals over the fifth dimension. Using boundary condition imposed on profile function it was found mass spectrum of the baryons. It was evaluated the value of the coupling constant for baryons in ground state. In the calculations it was used profile function of the ρ meson in the ground state.

HIGGS DECAY INTO h AND z BOSONS

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The higgs bosons of the MSSM can decay throgh various channels. İn this work we study the decay CP-odd Higgs boson A into CP-even Higgs boson h and a gauge boson Z^0 ;

$$A \Rightarrow h + Z^0 \qquad (1)$$

Feynman diagram of the .The transition amplitude of this process is given by

$$M(A \Rightarrow hZ^0) = ig_{AZh} A(P) h^*(p_1) U_\mu^*(p_2) \cdot R_\mu , \quad (2)$$

where $g_{AZh}=(\sqrt{2}G_F)^{\frac{1}{2}}M_Z\cos(\beta-\alpha)$is the coupling constant , A(p) and $h^*(p_1)$ are the wave function of A-and h-bosons, normalized to unity, $U_\mu^*(p_2)$ and M_Z are the polarization vector and mass of the Z^0-boson , G_F is the Fermi constant of the weak interactions,
$R_\mu = (p+p_1)_\mu$ is the sum of 4-impulses of the A-and h-bosons.

We also find the squared amplitude of the prosess:

$$\sum_{pol}|M(A => hZ^0)|^2 = g_{AZh}^2 R_\mu R_\nu \left(-g_{\mu\nu} + \frac{p_{2\mu}p_{2\nu}}{M_Z^2}\right) =$$

$$\sqrt{2}G_F cos^2(\beta-\alpha)\left[\left(M_h^2 - M_Z^2 - M_A^2\right)^2 - 4M_A^2 M_Z^2\right]. \quad (3)$$

The decay width is defined by the formula:

$$d\Gamma(A => hZ^0) \equiv \frac{(2\pi)^4}{2M_A}\sum_{pol}\left|M(A \Rightarrow hZ^0)\right|^2 \delta(p-p_1-p_2)\cdot$$

$$\frac{d\vec{p}_1}{(2\pi)^3\cdot 2E_h}\cdot\frac{d\vec{p}_2}{(2\pi)^3 2E_Z} . \quad (4)$$

In this case the transition amplitude does not depend on any angle, so it can be directly inteqrated:

$$\int \frac{1}{(2\pi)^2}\frac{d\vec{p}_1}{dE_h}\cdot\frac{d\vec{p}_2}{dE_Z}\delta(p-p_1-p_2) =$$

$$\frac{1}{8\pi M_A^2}\sqrt{(M_h^2 - M_z^2 - M_A^2)^2 - 4M_A^2 M_z^2} .$$

Therefore, the partial decay width of the Higgs boson A=>h+Z^0 is :

$$\Gamma(A => hZ^0) = \frac{G_F}{8\sqrt{2}M_A^3}cos^2(\beta-\alpha)\left[\left(M_h^2 - M_Z^2 - M_A^2\right)^2 -$$

4MA2Mz232 . (5)

The decay width $\Gamma(A => hZ^0)$ .With an increase the Higgs boson mass the decay width $\Gamma(A => hZ^0)$ is increase.

TEACHING METHOD OF DISCRETENESS OF THE ELECTRIC CHARGE

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At the present stage of the development of science, the electric charge is taken as the property of elementary particles. It is known the presence of an electric charge in a body or particle is manifested in the fact that they behave in a certain way-they interact with other charged bodies (particles). In the terminology of theoretical electrical engineering developed by the Technical Terminology Committee of the Academy of Sciences of the USSR, the following definition is given: "The electric charge - the property of particles of matter or bodies, characterizing their interrelation with its own electromagnetic field - has two kinds, known as a positive charge (charge of a proton, positron and etc.) and a negative charge (electron charge, etc.); quantitatively determined by the force interaction of bodies with electric charges. " In the Physical Encyclopedic Dictionary, an electric charge is defined as the source of an electromagnetic field associated with a material carrier. So, the presence of a body (particle) charge means that it is capable of electromagnetic interactions. The concept of electric charge and electromagnetic field are interrelated concepts. Consequently, the concept of electric charge can be formed only in conjunction with the concept of the electromagnetic field and etc. If we consider the electric charge and the associated field in different reporting systems, then in the case of uniform charge motion, one can obtain inertial reference systems where there is either an electric field, or both electric and magnetic fields. In the case of uneven motion, its field will always be electromagnetic, both electric and magnetic fields will exist and act simultaneously. Thus, for the description of electromagnetic phenomena, the choice of the frame of reference is essential. The electric charge is absolute (invariant) - it does not depend on the choice of the frame of reference. At present, the existence of this fact has been

experimentally proved. The electrical neutrality of atoms and molecules is well known. The charges of the electron shell of an atom and a nucleus are exactly equal to each other, but the nature of the motion of electrons and atomic nuclei is completely different. In addition, under chemical transformations, the motion of electrons in the shells of atoms changes.

SPATIAL STRUCTURE AND STABILIZATION CHARACTERISTICS OF METAL ION AND WATER MOLECULES (SEMIEMPRICAL ELECTROSTATIC MODEL).

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The complexes created by different ions in water are important in the organization and functions of alive organisms.In addition to alive organisms water metal complexes have a crucial role in determining the structure of many widespread crystals.That'swhy, one of the most actual issues of molecular physics, material science and molecular biology is the study of the spatial structure and properties of the complexes of water molecules formed by metal and non-metal ions and atoms..Theoretical models are used to clarify the structure of the complexes as well as structure of the complexes, as well as the relationship between spatial structure, as well as semiconductor and non-empirical methods based on molecular dynamics.molecular dynamics, quantum mechanics. The thesis is dedicated to the presentation of the results obtained from study of the molecular structure of complexes formed by water molecules through molecular mechanics and molecular dynamics methods. It is assumed that the water-ion interaction has dipole, monodipole, nature.It is assumed that the number of molecules in the first coordination layer is 6 .Initially, the interaction energy between the dipole representing the water molecule and the interaction effects energy in the approximation of the semiconductor load and the dipole-dipole are presented. The price of

energy is calculated for the tenth of the distance between the metal ion and the dipole. Then, in the center, the total electrostatic energy of the mh2o complex with a layer of ionized metal ion is given depending on the distance between the metal water molecules. In all cases, the dipoles have been oriented along coordinate axes, and this symmetry has been maintained for all prices. Comparative analysis of the findings suggests that the electrostatic model of metal ionic water complexes allows for a qualitative explanation of stabilization characteristics in the most common way.

INTERBAND LIGHT ABSORPTION IN SEMICONDUCTOR QUANTUM WELL

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The interband light absorption in quantum well with parabolic potential is studied. The influence of the uniform electric field on the absorption spectrum is considered for the case of electric field, directed perpendicularly to the layers of the quantum well. For well widths which are not very narrow the energy differences of the lowest levels between finit and infinit parabolic quantum well structures are very small and negligible [1]. So we use the harmonic oscillator wave functions for the electrons and holes to calculate the dipole matrix elements and the absorption coefficient. The absorption spectrum has the form of the density of states and consists from a series of steps with one step for each optical transition from valence subband to conduction subband. The selection rules for direct interband transitions are defined by the overlap integral of the conduction and valence envelope functions. For the symmetric parabolic quantum well only transitions between the valence and conduction subbands with quantum number of the same parity are allowed. However these selection rules break down and the transitions between arbitrary valence and conduction band states occur in the presence of the electric field. Hence the number of

the optical transitions (*i. e.* the number of steps) increases and the spectrum shape becomes more structured in the electric field. The threshold for the direct interband absorption is shifted towards the lower energies with an increase in the electric field intensity. The value of the absorption coefficient decreases with the increase in the applied electric field intensity.

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ELECTRICAL CONDUCTIVITY IN SUPERLATTICES IN A QUANTIZED MAGNETIC FIELD AT A SCATTERING OF CHARGE CARRIERS BY IMPURITY IONS

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Low-dimensional electronic systems are interesting because they exhibit such phenomena as negative differential resistance, conduction anisotropy, quantum Hall effect, and others. Layered compounds, including superlattices, in which the electron gas is quasi-two-dimensional and has a cosinusoidal dispersion law, are an ideal system for studying these transport phenomena. An external magnetic field influences differently the movement of current carriers along the conductor layers and perpendicular to them, and therefore the kinetic phenomena will significantly depend on the direction of the magnetic field. In this case, a number of peculiar effects arise that are not observed in a conventional three-dimensional electron gas. Among them, the orientation effect - is the dependence of the kinetic coefficients on the direction of the magnetic field relative to the axis of the superlattice.

In the present paper, we calculate components of galvanomagnetıc tensor ın superlattıces at a scatterıng of charge carrıers by ımpurıty ıons ın a quantızed magnetıc field. On the basis of the obtained expression for the relaxation time in the scattering of current

carriers on impurity ions, general expressions were found for the longitudinal and transverse components of electrical conductivity with an arbitrary degree of degeneration of the electron gas. Their dependences on the parameters of the energy spectrum are investigated and the magnetic field. On the basis of the formulas obtained, the anisotropy of the electrical conductivity of quasi-two-dimensional systems was studied. The ratio of the electrical conductivity along the layer to the electrical conductivity perpendicular to the layer is found. It is shown that, in contrast to phonon scattering, where the ratio of electrical conductivities is proportional to the ratio of effective masses, when scattered by impurity ions, this ratio (anisotropy coefficient) is proportional to the ratio of the screening radius to lattice constant across the layer. It was determined that in the strictly two-dimensional case the anisotropy coefficient of the electrical conductivity does not depend on the concentration of impurities and, therefore, the anisotropy in this case will also not depend on the concentration of impurities. In the quasi-two-dimensional case, with an increase in the concentration of impurities, the shielding radius decreases, which means that the anisotropy coefficient will also decrease.

TEACHING METHODOLOGY OF POLYTECHNIC TRAINING IN ACCORDANCE WITH SOCIETY'S REQUIREMENTS

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The development of any state, as well as Azerbaijan, is determined by the scientific and labor preparation of the growing generation capable of ensuring the development of science, the national economy. All pupils who have graduated from the school have to have important theoretical and practical knowledge, general and practical skills, the basics of modern production, and to be able to hold a certain place in the surrounding world. In other words, the school education process should be built taking into consideration the realization of the

principle of polytechnism in modern conditions. The school physics course have an important role here.

The idea of polytechnic training was first proposed at the end of the last century. This idea has found its basis in the work of K. Marx, who describes the basic principles of all the processes of production, and also teaches the student or the adolescent to apply the simplest tools of all production.

An explanation of the concept of polytechnic education and thepolitechnical principle was proposed by Nadezhda Krupskaya. "Polytechnicism is not a specific subject of teaching, it should incorporate all disciplinary rules and must be reflected in physics, in chemistry, in natural science, and in the selection of materials in the public. It is important that these disciplines are mutually compatible and that they are related to experimental activities, in particular with the habit of labor (labor education)." Principle situations on polytechnic training remain unchanged today. At the same time, there are some issues that pose a challenge to social change in the society, as well as the content of education (including polytechnic training) and teaching methods of polytechnic.

Polytechnic training consists of increasing the technical level of production at the expense of labor tools, technological processes, science-driven management, and the development of management processes, and has an enormous impact on emerging STP (Scientific and Technical Progress) worldwide. STP identifies important changes in production forces. The modern production base is increasingly in need of a large number of employees in the school, with a wide range of polytechnic views.

The main stages of today's polytechnic training are as follows:

- ✓ Acquaintance of students with main directions of STP;
- ✓ Acquaintance of students with physical bases of operation of a number of technical devices.

In addition to these basic stages of polytechnic training, others can be called: the development of creative technical skills of the students (which is particularly actual in the context of the multidisciplinary learning environment), justification and activation of

their cognitive activities, the development of creative thinking of students, the formation of their outlook.

The following components can be distinguished in the content of the polytechnical that should be included in the context of the learning material learned in physics classes:

1. Interaction of physics and engineering
2. The main directions of STP
3. Main areas of modern production
4. Specific technical facilities and technological processes
5. Socio-economic knowledge.

EXCITONS IN ABSORPTION AND PHOTOCONDUCTIVITY OF SINGLE CRYSTAL OF $TlGaSe_2$

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Single crystals of layered compounds, anisotropic and highly sensitive in a wide spectral range, are promising for use in optoelectronics and nonlinear optics. Such is the $TlGaSe_2$ single crystal from the class of $A^{III}B^{III}C_2^{VI}$ layered semiconductors with space group C_s^4. In the present work, data on the exciton photoconductivity of a TlGaSe2 single crystal are given. Conducted a comprehensive study of absorption and photoconductivity at 1.9-2.8 Ev and 77 ÷ 300K. TlGaSe2 single crystals with p-type conductivity for research are grown by the Bridgman method with the involvement of X-ray diffraction and thermographic analyzes for single-phase monitoring. Symmetric contacts to the samples were created from an In-Ga eutectic mixture. The electric field is directed along the layers, and the illumination is perpendicular to the layers. It was established that in the TlGaSe2 single crystal, the structures of the photocurrent spectrum EA1 = 2.127, EA2 = 2.212, EB1 = 2.355, EB2 = 2.387 Ev are due to exciton absorption (EA = 2.164, EB = 2.372 Ev), non-photoactive near the surface, and the behavior of the exciton features of EA in absorption

and a photocurrent at temperatures T1 = 105, T2 = 117, T3 = 200 ÷ 21K is typical for structural phase transitions of the first (T1, T2) and second (T3) genera.

LINE H_α IN THE SPECTRUM OF A STARHD 206267

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The spectral binary star HD206267 (HR 8281, O6.5V + O9V, V = 5.6) is a close binary system (CBS). This paper presents the results of investigation of the H_α line in the spectrum of the CBS HD206267, which locates at the stage of (O_1 + O_2) and known as spectral binary with a 3.709784 day period.

Spectral observations of the star HD 206267 were carried out during 2011-2014 at the Kassegrin focus of the 2-m telescope of the Shamakhy Astrophysical Observatory named after N.Tusi ANAS. Spectrograms were obtained and processed using the DECH20 and DECH20T software packages developed at the Special Astrophysical Observatory of the Russian Academy of Sciences.The echelle spectrometer with a CCD matrix (530x580 pixels) was used. The spectral range is λλ 4000–7000 ÅÅ, the spectral resolution is R = 13600, the signal-to-noise ratio is S / N ~ 100. Identified spectral lines are: H_α, H_β, HeII 5412, HeI 5875, NaI (5889.953 Å and 5895.923 Å).

The purpose of this work is to study the variability of the H_α line. It was revealed that the profiles of H_α lines obtained during one night differ from each other. The structure of profile of the H_α line is rather complicated. In some cases, narrow absorption components are observed in the core of this line. The presence of these lines in the spectrum of this star is most likely due to the presence of a shell around the main component. Theformation of the narrow absorption

components in the red side of the nucleus and its movement into the violet side during the night was revealed. Note that this process occurred within 70 minutes.

We believe that the appearance of discrete components and their movement in the nucleus of the H_α line can be explained by the formation and movement of a dense formation (clump) in the shell of the star HD 206267.

SCIENTIFIC-METHODOLOGICAL ANALYSIS OF MOLECULAR PHYSICS IN MODERN SCHOOL PHYSICS

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The molecular-kinetic theory and thermodynamics are used to explain the physical objects and phenomena learned by molecular physics. Based on these methods, exists kinetic, dynamic, and statistical concepts, laws, principles, ideas are interrupted and they are interconnected. It was attempted to include statistical physics into the elementary school physics course, but solving this problem is difficult because the theory of probability is not taught so extensive and profoundly in the school mathematics course and has not sufficiently worked on the methodology of forming statistical concepts and the school physics course. The important methodical issue of the unit is demonstrated the ratio between dynamic and statistical appropriately when studying heat phenomena. The transition from mechanics to molecular physics (thermodynamics) allows the obtaining of the essential purpose of methodology and shows the role of statistical ideas in the development of heat theory.

A. Einstein said, "Newton's motion law was formed the understanding and learning of the kinetic theory of heat, the conservation law of energy, the second law of thermodynamics in consciousness."

These words of A. Einstein, molecular - kinetic imaginations is

the beginning in study of thermodynamics, laws and concepts.

Dynamic imaginations should play a role in the study of the molecular-kinetic theory that does not complicate to understand the quality diversity of matter mechanical and heat.

HİGGS DECAY İNTO h- AND W-BOSONS

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After spontaneous symmetry breaking in the MSSM five Higgs bosons appear: the scalar H and h bosons, the pseudoscalar A boson, and the charged $H^{\pm}$ bosons.

The Higgs sector of the MSSM is characterized by six parameters: M_h ,M_H , M_A, $M_{H\pm}$, α and β. Of these six parameters, only two are free: the ones that are usually chosen are M_A and $\tan\beta$. The masses of the H and h $H^{\pm}$ bosons are expressed as M_A and M_W :

$$M^2_{H^{\pm}} = M^2_A + M^2_W .$$

The charged Higgs bosons $H^{\pm}$ can decay through various channels. In this work we study the decays Higgs bosons $H^{\pm}$ into CP-even Higgs boson h and a gauge boson $W^{\pm}$:

$$H^{\pm} => h + W^{\pm}. \qquad (1)$$

The transition amplitude of this process is given by:

$$M\left(H^{\pm} \Rightarrow hW^{\pm}\right) = \pm i g_{H^{\pm}W^{\pm}h} H^{\pm}(p) h^{*}(p_1) U^{*}_{\mu}(p_2) R_{\mu}, \quad (2)$$

where $g_{H^{\pm}W^{\pm}h} = \left[\sqrt{2}G_F\right]^{1/2} M_W(\pm)\cos(\beta-\alpha)$ is the coupling constant, $H^{\pm}(p)$ and $h^{*}(p_1)$ are the wave functions of $H^{\pm}$ and h bosons normalized to unity, $U^{*}_{\mu}(p_2)$ and M_W are the 4-polarization vector and mass of the W-boson , G_F is the Fermi constant of the weak interactions, $R_{\mu}=(p+p_1)_{\mu}$ is the sum of 4-impulses of the $H^{\pm}$ and h bosons.

The squared transition amplitude of the process is given by:

$$\sum_{pol}\left|M\left(H^{\pm} \to hW^{\pm}\right)\right|^2 = \sqrt{2}G_F \cos^2(\beta-\alpha)\left[\left(M^2_{H^{\pm}} - M^2_h - M^2_W\right)^2 - 4M^2_W M^2_h\right] \quad (3)$$

Having performed the calculations according to the usual MSSM rules , for the decay width $H^{\pm} \Rightarrow h + W^{\pm}$ we have the following expression.

$$\Gamma\left(H^{\pm} \Rightarrow hW^{\pm}\right) = \frac{G_F}{8\sqrt{2}\pi M_{H^{\pm}}^3} \cos^2(\beta - \alpha) \left[\left(M_{H^{\pm}}^2 - M_h^2 - M_W^2\right)^2 - 4M_W^2 M_h^2\right]^{3/2} . \quad (4)$$

As the mass of the Higgs boson $M_{H^{\pm}}$ increases , the decay width $\Gamma\left(H^{\pm} \Rightarrow hW^{\pm}\right)$ increases.

TRANSVERSE NERNST-ETTINGSHAUSEN EFFECT OF QUANTUM FILM IN QUANTIZED MAGNETIC FIELD

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In the present work we investigate the Nernst-Ettingshausen transverse effect of a quantum film in strong magnetic fields, when size- and magnetic quantizations take place. Energy spectrum discreteness manifests itself when the de Broglie wave-length becomes the same order as the film thickness and magnetic length. If the quantizing magnetic field is directed along the axis, then the energy spectrum will become completely discrete and formed by the superposition of Landau levels and size quantization levels:

$$\varepsilon = \hbar\Omega\left(N + \frac{1}{2}\right) + \varepsilon_1 n^2 , \qquad (1)$$

The two-dimensional degenerate electron gas are considered.

When scattering by piezo-acoustic phonons, Nernst-Ettingshausen transverse coefficient of a quantum film in a strong magnetic field has the form:

$$\frac{Q(d)}{Q(\infty)} = \frac{\pi}{3n_{эл}d^3}\overline{n}^2(\overline{n}+2) , \quad (3)$$

where $Q(\infty)$ is Nernst-Ettingshausen transverse coefficient of a three-dimensional electron gas, $\overline{n}$ takes on the values 1,2,3….

From formula (1) it stems that Nernst-Ettingshausen transverse coefficient oscillates with the film thickness. When the film level coincides with the Fermi level, Nernst-Ettingshausen transverse coefficient has a maximum. The film thickness at which the coefficient NE has a maximum system is determined by the formula: $d_{\max} = \left(\frac{\pi}{2n_{эл}}\right)^{1\backslash 3}\left[n_1^3 - \frac{n_1(n_1+1)(2n_1+1)}{6}\right]^{1/3}$ .The oscillation period is determined only by the concentration of current carriers and has the form:

$$\Delta d \approx 0{,}9\left(\frac{\pi}{2n_{эл}}\right)^{1/3}.$$

FARADAY ROTATION IN SEMICONDUCTOR QUANTUM FILM

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Advances in semiconductor technology have led to the possibility of creating nanoscale heterostructures, such as quantum wells, quantum wires and quantum dots, in which the electron's motion is restricted in one, two, and three directions, respectively.

In recent years, various types of ultrafast spectroscopy have been used in studies of the physical properties, in particular, the magnetic and optical properties of low-dimensional electronic systems, which allows us to directly control electronic and spin states by optical means. Optical experiments performed literally in recent years have shown that it is possible to create electronic spins, control them, and also accumulate them in various solid-state materials and, in particular, semiconductor nanostructures.

In the present work we have investigated the Faraday effect in semiconductor quantum film. The energy spectrum and wave functions

electrons and holes for a RQW with infinite barriers in a transverse magnetic field are given. It is shown that the Faraday rotation angle consists of a stepwise increase accompanied by a resonant behavior. Numerical results for the FR are presented for GaN/AlGaN RQW.

DETERMINATION OF ELEMENT ABUNDANCE OF THESTAR HD203574 (G5III)

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The results of investigations of the star HD 203574(G5III), using echelle spectrongrams obtained at the Cassegrain focus of 2-m telescope of ShAO of NAS of Azerbaijan were presented. The analysis of microturbulence of atmosphere and determination chemical composition have been performed. Physical theory of microturbulence have not developed satisfactorily yet. Therefore, the investigation of microturbulence is very important for the understanding the nature of the phenomenon, on the other hand, it is necessary to analyze the abundances of chemical elements of stars. For investigate of microturbulence exactly. To study the microturbulence the groups of lines of some atom or ion in a wide range of equivalent widths are ss required. In the spectrum of the investigating star the most appropriate lines are lines of FeI. Using these lines the microturbulence velocity in the atmosphere of this star have been determined as ξ_t=4,2 km/sec. By the comparsion of the calculated and the observed equivalent widths of spectral lines the chemical composition have been determined.

The chemical composition of star was determined by the comparsion calculated and observed values of equivalent widths of spectral lines. The calculation of the equivalent widths of the lines was performed using the program DASA, developed in Kr.AO. The determined chemical composition compared with solar one. The contents of many chemical elements found similar to solar one.

However, the contents of the elements Ca and Cu are some what smaller compared with the solar.

FARADAY ROTATION IN SEMICONDUCTOR QUANTUM WIRE

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The Faraday effect in low-dimensional semiconductor systems is the subject of many theoretical and experimental investigations. Interest in the Faraday effect is caused by its applications in physics, optics and nanoelectronics. These are definition of the effective mass of carriers or their density and definition of the lifetime of nonequilibrium carriers in semiconductors and low-dimensional structures on their basis, the amplitude modulation of laser emission for optical communication lines, manufacturing of optical nonreciprocal elements, magneto-optical recording and information display in both special and household purposes.

Progress in nanotechnology has made it possible to produce surfaces of different curvature from the layers of heterostructures, and particularly cylindrical surfaces which physical properties show interesting features.These structures can be described using a parabolic potential model.

In the present work we have investigated the interband Faraday rotation (FR) in a semiconductor cylindrical quantum wire (CQWR). This is a quantum system –nanostructure which confinement can be modelled by parabolic potential and at the same time electron-electron interaction does not influence on optical properties, i.e. it can be neglected. An analytical expression is obtained for the rotation angle as a function of an incident light energy and magnetic field. The selection rules are derived. Numerical results for the FR are presented for GaN/AlGaN wire.

DETERMINATION OF POTENTIAL PARAMETERS OF BeH AND CH MOLECULES

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Many compounds cannot study using conventional experimental methods that has too high a reactivity. It was possible to detect some radicals and ions in interstellar space on the basis of previously calculation properties. These particles have a very short lifetime in terrestrial laboratory conditions. The molecular properties of such radicals can be determined only by ab-initio calculation methods.

It has been calculated potential parameters of diatomic molecules at work. After studying potential parameters, we can calculate spectroscopic parameters of diatomic molecules. Potential parameters are expressed as derivatives of analytical expression of total electronic energy of diatomic molecules.

It has been calculated total electronic energy of molecules at seven different values of internuclear distance by solving Hartree-Fock-Roothan equations. It is constructed table of the dependence of total electronic energy on internuclear distance (R). The analytical expression of total electronic energy is searched as cubic polynom that depends on internuclear distance (R). By using the least squares method it has been obtained the analytical expression of total electronic energy of BeH and CH molecules. The numerical value of potential parameters has been calculated in internuclear equilibrium distance on the basis of these expressions.

CHANGES OF WIDES OF CORONAL LINES

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According to the research of many authors, the width of coronal lines across the solar disk is almost unchanged; the width of the coronal lines is determined by two motions: thermal motions of the ions and non-thermal motions caused by the MHD waves propagating in the corona. Since at all points of the corona the coronal line is radiated at the same temperature, we must say that the changes in the width of the coronal line are caused precisely by non-thermal motions on the wave. As an example, we can show the coronal line λ1037 OVI: in the center of the solar disk, the value of non-thermal velocities υ_{nt}=32 km/s, and closer to the limb υ_{nt} =34 km/s.

When observing the authors removes the spectrum from a large area of the disk. It is clear that in this site there are numerous Alfven and slow magneto-acoustic waves and, therefore, the observed coronal spectral line expands simultaneously with movements on both Alfven and magneto-acoustic waves. In other words, the non-thermal velocity found from the Doppler linewidth is the square of the sum of the squares of the most probable speeds of movement on the Alfven and slow magneto-acoustic waves:

$$V_{nt}^2 = \upsilon_{nt}^2(a) + \upsilon_{nt}^2(s).$$

Here: $\upsilon_{nt}(a)$ and $\upsilon_{nt}(s)$– non-thermal speeds of Alfven and slow magneto-sound waves, respectively.

How to find the values $\upsilon_{nt}(a)$ and $\upsilon_{nt}(s)$? We will find the valuesof these quantities from the following consideration, bearing in mind that the waves in question propagate in magnetic tubes, which are located perpendicular to the surface of the Sun. Further, the motions of slow magneto-acoustic waves occur along the magnetic tube, and the motions on the Alfven wave are perpendicular to the magnetic tube. Then, when viewed in the center of the solar disk, the line of sight is perpendicular to the movements on the Alfven wave and therefore at

the center of the disk $\upsilon_{nt}(a) = 0$, while the value of $\upsilon_{nt}(s)$ is maximum; near the limb, on the contrary: υ_{nt} (a) is maximal, and $\upsilon_{nt}(s) = 0$. Obviously, the non-thermal velocities observed at the center of the disk are the velocities of motion on magnetic sound waves, and the velocities of the non-thermal velocities observed closer to the limb are the velocities of movements on the Alfven wave. In this way:

$$\upsilon_{nt}(s)=32 \text{ km/s}, \upsilon_{nt}(a)=34 \text{ km/s}.$$

Obviously, depending on the angle θ on the surface of the Sun, the total velocity will vary as follows:

$$V_{nt}^2(\theta)= (32 \cos\theta)^2 +(34 \sin\theta)^2.$$

θ, (°)	0	10	20	30	40	50	60	70	80	90
V_{nt}, (km/s)	32,00	32,06	32,23	32,51	32,85	33,18	33,51	33,78	33,94	34,00

ELECTRONIC RAMAN SCATTERING FROM SURFACE OF SEMICONDUCTOR NANOTUBE

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An essential interest from the point of view of practical applications is the research of the electronic Raman scattering of light in semiconductor nanotubes. The goal of the present work is the construction of theory of Raman scattering on electrons moving along the cylindrical surface.

In the case of a simple semiconductor model, the known spectrum and wave functions of the electrons of the conduction and the valence bands are used by means of which the differential effective cross section of the intraband Raman scattering is calculated (this is the process of scattering, when the initial and final states of the electron are in the same band). At temperature T = 0 the valence band is completely

filled, and the conduction band is filled to the Fermi level and let this level is located in the lower conduction subband. The process of scattering consists of the following: the incident light with the frequency ω_0 translates an electron from the valence subband into one of the subband of conduction band. At the same time, the electron from the Fermi level drops into the hole created by the first transition and emits the scattered photon of frequency ω_1. In general, the scattering process reduces to the fact that the electron from the initial state in the subband of the conduction band enters the final state in the higher subband. For different polarizations of the incident and scattered light analytical expressions are obtained depending on the frequency shift (ω_0- ω_1) and the radius of the nanotube. The resonant and non-resonant cases are considered. The selection rules are found.

FIELD DEPENDENCE OF NERNST-ETTINGSHAUSEN TRANSVERSE EFFECT IN SUPERLATTICES FOR ACOUSTIC PHONON SCATTERING

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In the present work we calculate Nernst-Ettingshausen transverse coefficient in the superlattice. The dispersion law for an electron gas takes the cosinusoidal form. The charge carrier are scattered by acoustic phonons. We consider both quasi-two-dimensional and quasi-three-dimensional electron gases. It has been shown that Nernst-Ettingshausen transverse coefficient strongly depends on the magnetic field direction. In the longitudinal magnetic field the transverse Nernst-Ettingshausen coefficient is significantly influenced by the degree of mini-band filling. For the closed Fermi surface Nernst-Ettingshausen transverse coefficient with growing magnetic field decreases in the absolute value. For the open Fermi surface Nernst-Ettingshausen transverse coefficient increases in the absolute value. In strong

magnetic field the transverse Nernst-Ettingshausen coefficient has singularity. This fact is associated with presence of open cyclotron orbits in strong magnetic fields.

SPECTROPHOTOMETRIC CHARACTERISTICS OF FRAUNHOFER LINES IN THE SPECTRUM TOTAL FLUX FROM THE WHOLE SOLAR DISK

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The main spectrophotometric characteristics of a number of Fraunhofer lines in the spectrum of the total flux from the whole solar disk (i.e. in solar spectrum as a star) were determined. Digital spectral material obtained by rapidly scanning high-dispersion and high-resolution Fourier-transform spectrometer was used as a spectral material.

Residual intensities in this material are defined through $2\text{м}\,\text{Å}$. This allows constructing Fraunhofer line profiles with great accuracy.

Equivalent widths $W\,\text{Å}$, half- widths $\Delta\lambda_{1/2}\,\text{Å}$, quarter widths $\Delta\lambda_{1/4}\text{Å}$ and central depths R_0 of Fraunhofer line profiles were determined with great accuracy. A number of lines $MgI, FeI, CrI,$ and others were used. Spectral characteristics of lines were defined using the program ORIGN. Equivalent widths were determined by

$$W = 2\sum \frac{\Delta x_i}{3}[(R_0 + R_{2n}) + 2(R_1 + R_3 + \cdots + R_{2n-1}) + 4(R_2 + R_4 + \cdots + R_{2n-2})]$$

CALCULATIONS OF SOME THERMODYNAMIC MAGNITUDES IN SIZE-QUANTIZED DILUTED MAGNETIC SEMICONDUCTOR FILM

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At present the investigation of the the so-called diluted magnetic semiconductors (DMS) such as $Cd_{1-x}Mn_xTe$ and $Ga_{1-x}Mn_xAs$ combining the properties of the ordinary magnetics and semiconductors draw the great attention. It is necessary to notice, that initial researches of a DMS were conducted on the bulk crystal samples, however recently in connection with the progress of the methods the creation of the thin semiconductor films the interest to DMS film has considerably increased.

The present work is devoted to a theoretical research of thermodynamic properties of electron gas in a size-quantized diluted magnetic semiconductor film. On the basis of the great thermodynamic potential general expressions are found for such thermodynamic magnitudes as entropy and heat capacity are found at any degenerate degree of electron gas and any a film thickness. Influence of the exchange interaction and quantum well parameters of DMS films on the entropy and heat capacity is studied. It is shown, that in the case of nondegenerate electron gas the heat capacity of a ultrathin film is determined by the charge carriers concentration, quantum well and exchange interaction parameters. The dependence on a film thickness and band parameters in this case is logarithmic weak. Using these properties of a heat capacity it is possible to define a constant of exchange interaction and quantum well parameters. Entropy of the nondegenerate electron gas with account of the size quantization nonmonotonously changes with the film thickness. At certain conditions the entropy may be greater than in the bulk sample. Also it is shown, that in a case of the degenerate electron gas both the entropy

and heat capacity are proportional to the density of states and for the fixed value of a film thickness their dependence on Fermi energy has a step character. It is connected with the fact that every time when Fermi surface coincides with a bottom of the next film level, the state density and consequently these magnitudes must have a jump. In other words the entropy and heat capacity of DMS film with the depending on a film thickness will be oscillating. Besides, it is necessary to notice, that each film subband gives the equal contribution to the heat capacity. It is necessary to notice, that in a nondegenerate case the entropy and heat capacity do not depend on a constant of exchange interaction. The numerical calculation for $Cd_{1-x}Mn_xTe$ shows that at small concentration of charge carriers a heat capacity of degenerate electron gas inversely to the film thickness while for great values of concentration with increase of a thickness the heat capacity grows.

HI AND HII REGIONS IN PLANETARY NEBULAE

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The illumination of planetary nebula is entirely associated with the central star core radiation. This radiation leaves the center of a star to the gas and passes through a gas cloud. The gas can be conditionally divided into 2 regions: an internal part with a high degree of ionization $\left(\frac{n^+}{n_1} >> 1\right)$ and an external part with low degreeof ionization $\left(\frac{n^+}{n_1} << 1\right)$. The first part is light on the line of the atom, as a result of photonization and recombination, while the second part is not illuminated there. On the basis of the hydrogen atom, one of these parts is called the ordinary *HII* zone and the other is the *HI* zone.

If the temperature of the star is large enough for the second ionization of the given atom, then the nebula can be divided into three parts. In the closest part of the first star, when the atoms have a double ionization, the lighting occurs near the onefold ionized atom. In the next section contains onefold ionized atoms and it is illuminated on neutral atomic lines. In the last section, there is no lighting occurs, since only neutral atoms present that are formed from recombination .

Having considered the above, we can say that radiation in nebula have to be layered. The optical distance- τ should be calculated to determine how the ionizing quantum to define as far as it is characteristic of hydrogen at Layman cone. Until now, the optical distance has not been determined precisely because of the approximate assessment of the dyilion coefficient. This, in turn, leads to the fact that the ratio of hydrogen ions to the concentration of hydrogen atoms at the ground state $\left(n_1 / n^+\right)$ is uncertain.

HIGHER TWIST EFFECTS IN PHOTON-PHOTON COLLISION

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In the standard perturbative Quantum Chromodynamics (pQCD) picture, hadrons are produced by the parton jet fragmentation. However, higher-twist (HT) processes can also be used as production mechanism. The term ``twist'' emerged in the operator product expansion (OPE), which was a method used for obtaining predictions of pQCD in deep inelastic scattering.

Today, the term refers to contributions suppressed by powers of large momentum with respect to the leading terms. The leading-twist (LT) is standard processes of the pQCD within the collinear factorization, where hadrons are produced through fragmentation processes. On the other hand, HT processes are taken usually as direct hadron production, in which the hadron is produced directly in the hard subprocess rather than by quark/gluon fragmentation.

In this work, we have calculated the higher-twist contribution to the large- p_T meson production cross section to show the dependence on the chosen meson distributions amplitudes in the process $\gamma\gamma \to MX$.

The higher-twist Feynman diagrams, which describe the subprocess $\gamma q \to Mq$, contributes to $\gamma\gamma \to MX$ for the meson production in the photon–photon collision. The amplitude for this subprocess can be found by means of the Brodsky–Lepage formula

$$M(\hat{s},\hat{t}) = \int_0^1 dx_1 \int_0^1 dx_2 \delta(1-x_1-x_2)\phi_M(x_1,x_2,Q^2) T_H(\hat{s},\hat{t};x_1,x_2) \quad (1)$$

Analysis our calculations are show the higher-twist differential cross section monotonically decrease when the transverse momentum of the meson increases. Also in all distributions amplitudes of mesons, the dependencies of the higher-twist cross sections on the p_T transverse momentum of the meson demonstrate the same behavior. Our investigation enables us to conclude that the high twist meson production cross section in the photon-photon collisions depends on the form of the meson model wave functions and may be used for their study. Further investigations are needed in order to clarify the role of high twist effects in QCD.

THE INCLUSIVE PRODUCTION OF PION IN ELECTRON-POSITRON COLLISIONS

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It is well - known that quantum chromodynamics (QCD) is the fundamental theory of strong interactions. QCD describes the strong interactions between quarks and gluons, also the structure and dynamics of hadrons at the amplitude level. The hadronic distribution

amplitude (DA) in terms of internal structure degrees of freedoms is important in QCD process predictions. Parton DAs are important ingredients in applying QCD to hard exclusive processes via the factorization theorem. Understanding of the hadronic structure in terms of the fundamental degrees of freedom of QCD is one of the fascinating questions of the popular research area in physics. The important processes of the perturbative quantum chromodynamics (pQCD) are hadron pair production at large transverse momenta in hadron-hadron collisions.

The amplitude for this subprocess $e^-e^+ \to \pi q\bar{q}$ can be obtained by using the Brodsky-Lepage formula

$$M(\hat{s},\hat{t}) = \int_0^1 dx_1 \int_0^1 dx_2 \delta(1-x_1-x_2)\phi_M(x_1,x_2,Q^2) T_H(\hat{s},\hat{t};x_1,x_2) \quad (1)$$

The differential cross section for the process $e^-e^+ \to \pi X$ single pion production defined in this form:

$$\frac{d\sigma}{dx_1 dx_2}(e^+e^- \to \pi X) = \frac{4\pi\alpha}{q^3}\frac{d\sigma}{dx_1 dx_2}(\gamma^* \to \pi X)$$

$$\frac{d\sigma}{dx_1 dx_2}(x_1,x_2) = \frac{32\pi\alpha_S^2\alpha_E}{9q^4} 2 f_\pi^2 \left[\frac{e_1^2(1-x_3)}{(1-x_2)^2}\left[1+2(1-x_1)I\right]^2 + \right.$$

$$\left. + \frac{e_2^2(1-x_3)}{(1-x_1)^2}\left[1+2(1-x_2)I\right]^2 + \frac{2e_1e_2}{(1-x_1)(1-x_2)}\left[1+2x_3 I\right] + \frac{4\left[(1-x_1)e_1+(1-x_2)e_2\right]^2}{(1-x_1)(1-x_2)} J \right] \quad (2)$$

The HT cross section obtained in our study should be observable at a linear collider. Also, the feature of HT effects can help theoretical interpretations of the future PANDA experimental data for the direct inclusive pion pair production cross section in the electron-positron collisions.

WRITING ASSESSMENT CRITERIA

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Assessment criteria are generally simpler in their format than learning outcomes, and more varied in their format.
Assessment criteria should test, assess or relate to the learning that is mentioned in the learning outcome.
In writing learning outcomes it is important to introduce tentative language such as ‘the student is expected to...’ because it is not possible to make a student learn. In the case of assessment criteria it is appropriate to use 'the student will....’, because the student will only pass the threshold line, or gain a particular mark if she has fulfilled the criterion

Although they need to match the learning implied by the learning outcome, assessment criteria can be developed broadly from the learning outcome statement or from the assessment task.
Where the criteria are closer in wording to the learning outcome, they are likely to be fairly generalised in reference to what the learner should do allowing for the development of alternative assessment tasks and they are likely to be fewer. Where the criteria are developed from the task they are likely to be more detailed.

In writing assessment criteria, threshold assessment criteria give an assessment task needs to show in order to demonstrate that the learning has been has been achieved.

EVOLUTION OF POLARIZED ELECTRON-PHOTON SHOWER IN CRYSTALS WITH VARIUS INITIAL CONDITIONS

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Modern accelerator technology and existing modern electronic and muon detectors allow investigating non-elastic electromagnetic interaction of high- energy electrons, muons andγ-quanta with atoms and nuclei of matter.

When high-energy charged particles (e,μ) and γ-quanta pass through matter, in addition to separate acts, they give birth to shower structures under certain conditions. These shower structures are continuously directed jets of various particles, such as, charged particles in solid and gas meters, electron (muon) - photon showers in amorphous and crystal environments, nucleon cascades in nuclear matter. Electromagnetic showers in resulting from interactions of high energy particles with atom nuclei in crystal environment are main source of electron, positron and photon beams of high energy and also are excellent tool for investigation of matter structure and electromagnetic properties of nuclei.

This article deals with theoretical investigation of polarized electron- photon showers in crystals at two different initial conditions for emergence of shower: 1) shower is created by high energy (E_0) initial lepton ($e^{\pm}$, $\mu^{\pm}$); 2) shower may also be created by initial high-energy γ-quantum (E_0). We were there first who wrote down equations for the evolution of electromagnetic shower in crystals and found solutions to these equations under initial conditions indicated above. Analytical expressions that we obtained for the distribution of shower leptons and γ-quanta are

$$P_{1,2}(t, E_0, E) = F_{1,2}(s, \lambda_1)\exp(sy - \lambda_1(s)t),$$
$$\Gamma_{1,2}(t, E_0, E) = \Phi_{1,2}(s, \lambda_1)\exp(sy - \lambda_1(s)t).$$

Here s - is Laplas-Mellin parameter, E_0, E- are initial and current energies of shower particles, t –is depth of penetration, $F_{1,2}(s,\lambda_1)$, $\Phi_{1,2}(s,\lambda_1)$, λ_1 and y- are some functions depending on s, initial energy of particles and initial conditions.
Detailed analysis of these functions for silicon crystal indicates that initial conditions make strong impact on both distribution function of shower particles and their polarization properties.

CURRENT STATE IN REGGE'S THEORY

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There is an effective theoretical-phenomenological approach to the problem of scattering - studying the properties of the scattering amplitude for complex values of the orbital angular momentum or the Regge pole method in quantum field theory. However, the Regge approach itself is universal, i.e. in no way connected with QCD or with any other quantum-field model.

For processes elastic diffraction hadrons at high energies by the method Regge poles the unknown function of two variables (scattering amplitude) in the expression for the differential cross section can be replaced on the mathematical structure, containing several unknown functions of one variable — Regge trajectories, also called in the literature reggeons and Regge form factors of the particles involved in the reaction

From the point of view of diffraction physics the behavior of the Regge trajectories is most important, not only using the phenomenology of hadron spectroscopy and diffraction scattering, but also coordinating this behavior with the fundamental results obtained in the framework of perturbative QCD.

Applied Physics (posters)

ABSORPTION OF LIGHT BY FREE CHARGE CARRIERS WITH THE PARTICIPATION OF PHONONS IN A QUANTUM WIRE

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At present, low-dimensional systems attract the attention of researchers due to their unusual optical and optoelectronic properties, which can be used to develop new optoelectronic devices. The reduction of dimensionality during the transition from quasi-two-dimensional to quasi-one-dimensional should lead to significant changes in the physical properties of nanostructures. The mechanisms of optical absorption in low-dimensional systems differ qualitatively from similar processes occurring in bulk semiconductors due to the difference in the energy spectrum of charge carriers. Absorption of light by a free carrier is possible only with the obligatory participation of any third particle (quasi-particles), which can be phonons, impurity centers, as well as other surface roughness, dislocations. The participation of the third particle in this process ensures the fulfillment of the law of conservation of momentum.

The considered process of light absorption by free carriers with the participation of phonons is calculated with the known formula:

$$\alpha = \frac{\in^{1/2}}{n_0 c} \sum_i W_i f_i$$

where $\in$ - dielectric constant of medium, n_0 – the number of photons in the radiation field and f_i – carrier distribution function. Summation is performed over all initial states of the ‘‘ i ’’ system.

INVESTIGATION OF STRATS IN ARGONE GAS

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In the plasma of the positive gas discharge column, various instabilities often develop. Under certain conditions, small initial fluctuations rapidly grow, and as a result instability arises in the plasma. Often, these instabilities are accompanied by the appearance in the plasma of various kinds of oscillations having a wide range of frequencies. Among them, an important place is occupied by ionization instability, leading to the formation of strata.

There are two types of strata of ionization nature - running and standing (motionless). The traveling strata are waves of concentration and temperature of electrons propagating, as a rule, from the anode to the cathode. The strata are a peculiar class of waves, in which the group velocity is opposite in direction to the phase velocity.

Standing strata are a special type of wave whose frequency is zero and the wavenumber is non-zero.

Natural strata arise in the positive column without any external source of periodic perturbations. The gas discharge has inherent properties of reactive elements, primarily inductance. The entire electrical circuit containing the gas-discharge element, in general, has reactive properties, forming an oscillatory system. Therefore, the strata in the discharge are self-oscillations in a system with distributed parameters.

In this paper, we study the conditions for the occurrence and existence of natural strata oscillations in the discharge, and also consider the possibility of exciting artificial strata in a pre-quiet plasma and study their characteristics.

Experiments were carried out in the positive column of a non-independent arc discharge with an artificially heated cathode. The working gas is argon at pressures from 0.1 mm Hg. up to 1.0 mm Hg The strength of the discharge current varied from a few mA to 200 mA.

For the excitation of artificial strata, a generator of sinusoidal oscillations of sound frequency was used, which was connected to the circuit in series with the discharge tube. Artificial traveling strata were obtained by external action in a plasma-free plasma. It is shown that the frequency of these strata is equal to the frequency of the external driving force and "follows" the change in the frequency of the driving force. At some value of the frequency of the external force, the strata disappears.

SPATIAL STRUCTURAL ORGANIZATION OF THE TYR-ALA-GLY-ALA-VAL-VAL-ASN-ASP-LEU MOLECULE

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The spatial possibility of the H-Tyr-Ala-Gly-Ala-Val-Val-Asn-Asp-Leu-OH molecule corresponding to the sequence 329-337 of the *C*-terminal region of the ribonucleotide reductase subunit 2 of the herpes virus was studiedby the method of theoretical conformational analysis.

The method of theoretical conformational analysis usually used in studies of the spatial structure of small organic molecules. We used this method in the study of the capabilities of the synthesized peptide; therefore, the present work is a continuation of our studies of the structural-functional organization of peptide molecules.

By using the solid phase approach, was synthesized peptide moleculesH-Tyr-Ala-Gly-Ala-al-Val-Asn-Asp-Leu-OH (I), corres. ponding to sequence 329-337 of the subunit 2*C*-terminal region of the herpes virusribonucleotide reductase(HSVR2)and its analogues.

The aim of this work is tostudy the structural and functional organization of the moleculeH-Tyr-Ala-Gly-Ala-Val-Val-Asn-Asp-Leu-OH (I) and compute all the energy-favorable and, therefore, potentially physiologically active conformations.

The spatial structure of peptide (I) was studied by multiple fragments.Theconformational analysis of fragment Tyr^{329}-Ala-Gly-Ala-

Val^{333}was performedwith regard to low-energy conformations of tyrosine [7], alanine, glycine and valine [8]. For the *N*-terminalTyr, two forms of the backbone, *B* and *R*, were chosen, since forms B and L are indistinguishable. Alanine is considered in three *(R,B,L)* forms, valine was considered in two possible orientations of the side chain *(R,B,L)*, and glycine in the four *(R,B,L,P)*.

The original set of structural forms of thepentapeptide fragment Tyr^{329}-Ala-Gly-Ala-Val^{333} includes 160 conformations of the main pentapeptide backbone.

The spatial structure of theH-Tyr^{329}-Ala-Gly-Ala-Val-Val-Asn-Asp-Leu^{337}-OH (I)was investigated on the basis of the stable conformations of the pentapeptide fragments Tyr^{329}-Val^{333} andVal^{333}-Leu^{337}.These pentapeptide fragments have a common aminoacid residueVal^{333}. Therefore, uponzero approximating nonapeptide molecules (I), we composed combinations offragments Tyr^{329}-Val^{333} andVal^{333}-Leu^{337} withVal^{333}in the same backbone conformation.

The computations of the two pentapeptides demonstrated that the *N*-terminal fragment is more rigid than the *C*-fragment.The *N*-terminalTyr^{329}-Val^{333} is presented by six shapes of the peptide backbone (*eeff, ffff, effe, eefe, fffe, eeff*).

PREPARATION OF GRADED DISTRIBUTION OF COMPOSITION THROUGHOUT THE BINARY SOLID SOLUTION MONOCRYSTALS

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In contemporary solid solution electronics semiconductor monocrystals of different characteristics are used in order to produce different devices with variable parametres .On the other side the cultivation of monocrystals demands great amount of money, hard work and a long time from technological point if view.For example,for cultivating monocrystals with variable parametres in one and the

same device ,you need to disassemble the device, to prepare it again,to fix it and to get the vacuum.But for getting effective use of the device and time ,we could have variable parts with fixed composition at every process of monocrystal cultivation,thus the composition being distributed throughout the monocrystal.In this case the cultivated monocrystal can substitute different monocrystals with variable composition.The main goal of current investigation is to work out the ways of obtaining monocrystals with graded distrubution of compostion from binary solid solutions with strong seggregation during the crystallizaton.The processing and preparation of new product is based on the analysis of consistent equation for the second component matter flux .The simplest way of getting a graded composition distribution is the usage of nutritious alloy with complicated geometric structure .The initial state of nutrient is to be cone shaped ,then comes cylinders substituting each other and parts with cut-cone structures.To define the useful selection of sequence of grades is also of great interest .The first grade is to be selected in such a way that extreme coldness could be possible to eliminate in the field of crystallization. Then comes the substitution of cylindric and cut-cone parts. The condition of crystallization must be chosen so that the alloy should be always left in the pute.The law of composition change throughout the crystal is purposefully differentiated on the basis of consistency equation.

FEATURES OF PHOTOCONDUCTIVITY IN $Cu_3In_5S_9$ SINGLE CRYSTALS

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In this work, optical and temperature dampings of photoconductioity of $Cu_3In_5S_9$ monocrystal have been learned. Optical damping of photo conductioity is the drect result of the discharge of recombination centers during the doping excitation. The essence of the optical and temperature dampings are that the photo currend which

made by the particular light may decrease with the light or temperature in the definite region of spectrum. For mea surements, samples of the size of 4x2x0,5 mm^3 were cutted from the monecrystal and omic contact made from ag paste was added concentration and mobility of chage carrers for these samples at 300 K are egual to $n=10^{16}$ sm^{-3} and $\mu=10\div30$ $sm^2/V\cdot s$, accordingly. Electrical field was appliced according to the direction of layers. Mea suremends were carried out in the condition of 77 K. Infrared damping of photo conducarried out in the condition of 0,6- 1,3 eV observed for all studied samples. In the case hν>1,3 ev, photoconductioity begins to increase. The depth of the infrared damping was determined from the ratio of intensities of particular and damping lights. Temprature dependence of photo conductioity shows that, when the temprature increase from 150 K to 300 K, photo currend firstly increase and this is explaned with increasing of life time carriers at the 240 K, photo current starts to decrease. In the region 240-300 K, temperature damping of photo conductioity was opserved.

ELECTRICAL AND PHOTOELECTRICAL PROPERTIES OF HETEROJUNCTIONS p-Si/$Cd_{1-x}Zn_xO$

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ZnO is one of the most intensely studied metal oxides that exhibit wide bandgap (≈3.3 eV) at room temperature and CdO is conducting and transparent in the visible region with a direct band gap of 2.5 eV. However, cadmium oxide is characterized by a much lower resistivity. Therefore, the resistivity of ZnO can be decrease by alloying with CdO to have low resistivity front-contact for solar cells. Creation of solid solutions on the basis of various metal oxides allows changing physical properties and bandgap of thin films that is actual at designing of photonic devices with high performance in various spectral ranges. In this paper we demonstrate $Cd_{1-x}Zn_xO$ based heterojunction using p-

type Si as substrate. Heterojunctions of $Cd_{1-x}Zn_xO$/p-Si were deposited by the method of electrochemical deposition. The electric and photoelectrical properties of $Cd_{1-x}Zn_xO$/p-Si heterojunctions, surface morphology and optical properties of $Cd_{1-x}Zn_xO$ films were investigated depending on the electrochemical deposition regime. It is found out that heterojunctions $Cd_{1-x}Zn_xO$/p-Si with nano-structured surface, which deposited at cathode potential of -1,2÷-1,28 V, shows good rectification (k≈380). Under AM1.5 conditions (W = 100mW/cm^2) the maximal values of open-circuit voltage, short-circuit current, fill factor and efficiency of our best nano-structured cell, were V_{oc} = 202 mV, J_{sc} = 1.3 mA/cm^2, FF = 0.4 and η = 1.7 %, respectively.

ELECTROPHYSICAL PROPERTIES OF COMPOSITE MATERIALOF POLYSTYRENE + Al_2O_3 RADIATED BY UV

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At present, the creation and application of stable composite materials as dielectrics with predetermined electrophysical parameters is of great scientific and practical importance. In this paper, the effect of ultraviolet radiation on the composite material, polystyrene with the addition of Al_2O_3 with different concentrations, is investigated.

The temperature dependence of the dielectric constant and dielectric loss before radiation is also studied. Shows some results of the dielectric constant and dielectric loss values of composite materials prepared by the new method, that is, with the release of benzene from solution of polystyrene + Al_2O_3 with high concentration, calculated by the standard formula.

$$\varepsilon = \frac{Cd}{\varepsilon_0 S} \qquad (1)$$

There, ε – are the dielectric constant of the investigated samples, – is the capacitance of the manufactured capacitor, in which test

sample of polystyrene+Al_2O_3 composite is located between the plates, d – is the sample thickness, S – is the capacitor plate area, $\varepsilon_0 = 8{,}85 \cdot 10^{-12} Ф/м$.

$$tg\delta = \frac{J_a}{J_r} \qquad (2)$$

There, δ – is the dielectric loss angle, J_a – is the current density due to the active and J_r – is the current density due to the reactance resistance.

It was found that change of Al_2O_3 concentration in the range of 0÷45 wt% leads to the change of dielectric constant from 2.25 up to 3.25; and the values of tgδ from 2.6 up to 4.3. The dielectric constant decreases, and dielectric loss increases slightly, with increasing temperature from 0 up to $90C^o$.

IMPULSE PLASMA TECHNOLOGY IN THE GROWTH OF THIN FILM MATERIALS OF SILLENITE STRUCTERED COMPOUNDS

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Sillenite-structured compounds ($Bi_{12}GeO_{20}$, $Bi_{12}SiO_{20}$ and Bi_8TiO_{14}) have a number of practical properties - transparency in a wide range, high electrooptic, photoconductivity, memory properties and also have a high resistivity. These properties significantly increase growth of thin film materials of mentioned compounds and their application in the electronics. Thus, most of modern microelectronic devices are developed on the basis of active elements which are made from thin films of sillenite-structured compounds. Growth of thin films of such kind compounds encounter with a number of diffuculties.The most important of these ones is the formation of easy and difficult evaporating elements of compounds when forming thin films of such compounds. However, impulse plasma evaporation is able to eliminate this difficulty .

The impulse plasma evaporator consists of a coaxial electrodes system which are isoloted from each-other , for exapmle, by GeO_2. The electric discharge space is made of evaporated substances (GeO_2, Bi_2O_3) and the electrodes which are made from bismuth (Bi). Discharging is generated by giving a high-voltage impulse to the detonator electrode. The thickness of films depending on the discharge power and varies 0,2-1 μm. The investigation of these films by Atom Microscope shows that the films have the same structure throughout the entire surface. Researches showed that these thin films have cubic polycrystalline structure and when heated up to 150 – 200 ºC, their structures are transformed to the monocrystalline structure

Impulse Plasma Evaporation Technology has a number of other advantages in the growth of thin films. this method allows to get thin films faster, the high speed and temperature of the plasma flood allow to get higher quality films and higher adhesion of the films to the substrates.

PHOTOELECTRIC PROPERTIES ZnS:Co (Cr) THIN FILMS

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In this work, ZnS:Co (Cr)thin films were prepared by chemical bath deposition and electrodepotion technique. The physical properties of the chemical deposition of ZnS:Co (Cr)films are dependent upon the growth parameters such as the bath temperature, the relative concentrations of the various reactants in the solution the pH value and the type of substrate. The chemical bath deposition technique was used to deposit the thin films of ZnS:Co (Cr)on glass and porous silicon substrate. Triethanolamine (TEA) was used as a complexing agent. Ammonia solutions were used to adjust pH of the reaction mixture. Finally, the substrates then washed with distilled water and annealed at temperature 225^0C. In order to obtain good quality of thin films, following parameter were adjust such as deposition time, temperature

of deposition, pH of the solution is adjust by addition of liquid ammonia drop in the prepared solution.

The Phase purity and surface morphology properties were studied using X-ray diffractogram (XRD). The phase purity of the film was analyzed with X-ray diffractogram (Miniflex Model, Rigaku, Japan) using CuKαradiation with a wavelength of 1.542 Å. The structural characterization is very important in explaining structural, micro structural and electrical properties of ZnS:Co (Cr)thin films.

This work reports the effect of Zn composition on structural, micro structural, electrical and optical properties of these films. All samples exhibits photoconductive effect when excited by light source. The ZnS:Co (Cr)photoconductor behaves like an ohmic resistance that depends upon the intensity of source. The photo decay methods are employed both for investigation of the photo-sensitive, photovoltaic's and photo switching devices. The time response of photocurrent for ZnS:Co (Cr)for several cycles as the light was turned ON - OFF, shows photo response properties and shows high photosensitivity and hence ZnS:Co (Cr)is used for opto-electronics, photo sensor applications. This study will have significant impact on the use of ZnS:Co (Cr)in optoelectronics devices.

EFFECT OF ELECTROLYTE CONCENTRATION ON THE OPTICAL PROPERTIES OF CdS NPs

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Electronic spectrum of charge carriers in semiconductor nanoparticles depends from size and potential energy of charge carriers. When the NPs surrounded by electrolyte solution the potential energy of charge carriers will be changes. The changing of potential energy will be depended from charge and dipole moment of ions and molecules. In results of ion-electron, ion-hole, dipole-electron and other interaction the potential energy of charge carriers inside the

nanoparticles changes and then the energy spectrum of charge carriers also changes.The spectral change affects the electrical optical properties of the NPs. The main purpose of this study is to investigate the effects of CdS nanoparticles on nanostructures when they placed in different environments. Various environments differ from each other by the dipole moment, the concentration of the solution or ion, and the formation of the molecules. Due to the change energy mean, the price of the band gap will change. In this work $Cd(NO_3)_2$, $Cd(CH3COO)_2$ and NaCl were used to study how the concentration of electrolytes affects to optical properties of CdS nanoparticles. For all three salt measurements were made 0,01; 0,1; 1; 2 M concentrations. The absorption spectra were obtained by changing the concentration according to all three salts. As a result of the experiment, we show that the band gap decreases by increasing the concentration of the solution.

EROSION OF THE ANOD SURFACE IN PULSE PLASMA EVAPORATOR

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Electric erosion, i.e destruction of a material of electrodes under action of the electric catagory, takes place to same extent in all pulse devices, including in the pulse plasma evaporator. The thermal nature of this phenomenon at pulse categories now is conventional and proceeds from the equation of heat conductivity describing in a general view a course of thermal processes in anybody at passage of an electric current.

At moderate thermal streams on electrodes that is usually realized in stationary categories with currents up to ,the basic power consumption is connected to evaporation of an electrode material; intenal energy of products of destruction and heat of fusion are rather small.At realization of such quiet mode of evaporation, speed od

evaporation, speed of evaporation linearly on a proceeding charge through a digit interval that proves to be true from the resulted experiments by definition of speed of erosion depending on a charge.

Apparently from the schedule, speed of erosion of electrodes is linearly connected to a proceeding charge and increases with reduction of temperature of fusion of the investigated materials.Destruction of electrodes in this case proceeds, basically, in a steam phase that proves to be true an unstructured film eroding substances on a surface of a target.However, the increase in a digit current up to 10kA also higher can lead to qualitative changes in processes proceeding on electrodes.

DYNAMICS OF DISCHARGE DEVELOPMENT IN LONG TUBE WITH VARIABLE DISTRIBUTED CAPACITY

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The process of breakdown of long discharge gaps belongs to the class of well-distributed physical phenomena. During such a breakdown, the ionization fronts move in the gas, accompanied by charging of the distributed capacity (the surrounding space in the lightning leader or walls during electrical breakdown of the discharge tubes). Recently, the study of wave breakdown has acquired particular relevance, since, in addition to purely scientific interest, the study of this phenomenon has gained new practical significance, caused by the expansion of its applications in laser technology, in plasma oscillators, generator of second impulses, etc.

When studying ionization waves, the normally distributed capacitance C_0 (referred to the unit length) is assumed considered constant in length. At the same time, in practice, the distributed capacitance can be a quantity varying along the spacer.

In this work, we investigated the dynamics of a breakdown wave along a tube with a capacitance varying linearly along its length, with

the values of C_0 at the beginning and end of the tube differing by a factor of 20 times

From the physical picture of the breakdown waves, it follows that capacitance C_0 affects the main parameters characterizing the process (front speed, current magnitude on the tube walls, etc.).Special studies on the propagation of ionization fronts along intervals with variable capacitance , apparently, were not carried out .The authors know only the work, where in the central part of the external metal wire located along the gap with which the discharge was initiated, there was a U-shaped bend, which significantly influenced the speed of the tape drive.

The power supply from the sound generator was increased by means of a transformer, rectified in the negative half-period, and applied between the ground and the electrode, called the igniter .The second electrode remained free. Then the breakdown process became repetitive with the frequency of the applied voltage.

INFLUENCE OF HEAT TREATMENT ON CHARACTERISTICSOF Al/n-Si SCHOTTKY DIODES

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Metal-semiconductor contacts on the basis on Schottky barrier diodes (SBDs) most widely used both in electronic and optoelectronic applications, due to their advantageous properties in comparison with p-n transitions: simple technology, a wide range of contact materials, quick switching. On the other hand, the performance and reliability of these contacts are dependent on the choice of crystal structure of contacting materials and technology of fabrication.In the present paper have been investigated Al/n-Si Schottky diodes subjected to a heat treatment in the 450-580^{o}C range. For the fabrication of Al/n-Si(111) contact structures was used the method of vacuum evaporation, Single crystal n-type silicon (P-doped) wafer Si(111), with 3inch diameter, 0.7

Ωcm resistivity and 3.5 μm thickness an Al film with the thickness about 0.6 μm. the vacuum about 10^{-4} Torr, the temperature of preliminary heating of the substrate plates in chamber was 523K during 250 sec . Then the samples were subjected to a heat treatment in the 450-580^{o}C range in Hydrogen atmosphere for 15 min to 60 min.

At room temperature the forward and reverse bias current–voltage (I–V) characteristics of Al/n-Si SBDs were measured at applied bias voltage ranges of (-25)-(2) V. Obtained characteristics clearly obey the usual thermoionik emission theory:

$$I = I_o\left[\exp(\frac{q(V)}{nkT}) - 1\right] \qquad (1)$$

,

The values of n and I_o were found as 1.01 and 3.82×10^{-8} A under 450K treatment, 1.46 and 4.3×10^{-10} A under 580^{o} C, respectively. The values of Φ_{Bo}were calculated as 0.63 eV under 450K treatment and 0.75 eV under 580^{o} C, respectively. In result, was revealed, that meanings of saturation current decreases and potential barrier hight increases with increasing of temperature of treatment. Obtained result has been attributed to the diffusion of Al into Si(111) at heat treatment.

ABSORPTION AND LUMINESCENCE OF GALLIUM SELENIDE UNDER THE ACTION OF LASER RADIATION

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The absorption and luminescence spectra of GaSe under the action of laser radiation were experimentally investigated. Samples with a thickness of 20–100 μm and an area of 1–3 cm^2 were made by cleaving large ingots in a direction parallel to the optical axis. The radiation source used was a pulsed Nd: YAG laser with built-in 2nd and 3rd harmonic generators, designed to generate radiation with a wavelength of 1064, 532 and 335 nm. The laser pulse duration was 12

ns with a maximum power of ~ 10 MW/cm^2. The absorption and photoluminescence spectra were measured using an automated monochromator with double dispersion M833 (spectral resolution ~ 0.024 nm at a wavelength of 600 nm) with computer control and a detector recording radiation in the wavelength range of 350–2000 nm.

The absorption spectrum of thin GaSe films consists of a very narrow peak with a maximum λ = 620 nm. The band gap in GaSe, determined from the $\alpha^2 \sim f(h\nu)$ dependence, turned out to be equal to Eg = 2.02 eV. The maximum of the luminescence spectrum of GaSe under the action of the 2nd harmonic of the YAG: Nd laser (λ = 532 nm) is shifted to the short-wave region of the spectrum by the value of 20 nm. It is shown that the radiation shift in the luminescence spectra of thin GaSe films at high levels of optical excitation towards short wavelengths is due to the filling of subbands in the conduction band with non-equilibrium carriers generated by laser radiation. The concentration of nonequilibrium carriers created by a laser with a photon intensity I = 1.5 × 10^{25} photons/cm^2·s, a duration Δt = 12 ns and a fundamental absorption coefficient $\alpha \sim 10^3$ cm^{-1} is equal to $\Delta n = \alpha I \Delta t$ = 1.8 × 10^{20} cm^{-3} As a result of filling the conduction band with non-equilibrium current carriers with a concentration of ~ 10^{20} cm^{-3}, radiative recombination occurs, with an electron transition energy greater than the width of the forbidden band. Knowing the concentration of nonequilibrium carriers generated by laser light, it is possible to determine the height of the filling zone ΔE by the formula

$$\Delta n = \frac{8\pi}{3h^3}(2m_e \Delta E)^{3/2} \qquad (1)$$

Using the values of the effective mass for GaSe ($m_h = 0.5m_0$) and also knowing the concentration of non-equilibrium carriers (Δn = 1.8 × 10^{20} cm^{-3}), using equation (1), one can determine ΔE. Estimates show that to fill the zones in GaSe by $\Delta E \approx 50$ meV, a concentration of non-equilibrium carriers of ~ 1.8 × 10^{19} cm^{-3} is required. As can be seen, the concentration of non-equilibrium carriers generated by laser light is much higher, the concentration of non-equilibrium carriers calculated by the formula (1).

INFLUENCE OF THE INTENSITY OF LASER RADIATION ON THE EDGE OF THE ABSORPTION BANDGALLIUM SELENIDE

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Laser processing is an efficient method for adjusting the properties of semiconductors. Varying the ratio of quanta energy $\hbar\omega$, radiation intensity *I*, and bandgap *Eg*, one may alter the near-surface ($\hbar\omega > Eg$) or bulk ($\hbar\omega < Eg$) properties. The study of processes induced in thin InSe films by ultrahigh light fluxes is of academic and applied interest. Ultrathin layers of indium monoselenide have unique properties that distinguish it from other two-dimensional crystals. The electron mobility in two-dimensional InSe samples is record-high (~7000 $cm^2/(V\ s)$). This parameter is crucial for enhancing the performance of devices based on semiconductor materials.

The studied *n*-InSe single crystals were grown in accordance with the Bridgman–Stockbarger technique in automatic mode, which allowed us to produce perfect single crystals with a mirror-like surface. Samples with a thickness of 1.2–1.5 μm and an area of ~(2 × 5) mm were fabricated from large ingots by cleaving in the direction parallel to optical axis. A semitransparent In layer was deposited onto freshly cleaved surfaces by vacuum evaporation. According to the results of Hall measurements, the resistivity, the carrier density, and the carrier mobility in the direction parallel to optical axis were $\rho \approx 4.2 \times 105\ \Omega$ cm, $n \approx 1016\ cm^{-3}$, and $\mu_n n = 1500\ cm^2\ V^{-1}\ s^{-1}$. A pulsed Nd:YAG laser with built-in generators of the 2nd and 3rd harmonics, which was designed to produce radiation with a wavelength of 1064, 532, and 335 nm, was used as the radiation source. The pulse length was set to 12 ns with a maximum power of ~12 MW/cm^2. The radiation intensity was adjusted with calibrated neutral light filters. A lens was used to focus the single-mode laser beam onto the sample surface with a spot

diameter of ~3.0 mm. Conductivity inversion was observed when thin *n*-InSe films were subjected to pulsed laser irradiation with λ = 1064 nm and a power of ~6 MW/cm^2. The irradiated sample section, which had *n*-type conductivity prior to irradiation, switched to *p*-type conductivity after laser processing. The current–voltage curves (CVC) were also modified by irradiation, CVC was symmetric and linear prior to irradiation, after irradiation, the CVC assumed a diode shape with a rectification ratio of ~2×10^2 at 2 V. The mechanism of current passage through the *p–n* junction was of a recombination nature.

ELECTRONIC AND OPTICAL PROPERTIES OF ZnSSe (Mn) NANOCRYSTALS

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In this review article the fabrication of ZnS nanoparticles doped with Mn, by various methods such as chemical precipitation have been studied. The synthesized nanoparticles were being characterized by using XRD, TEM, UV-Visible spectroscopy, and PL spectroscopy. Doping of ZnSSe(Mn) with Mn, alters the band structure, optical and chemical properties and enhances the luminescence properties. The ZnSSe:Mn nanoparticles and thin films on silicon and glass substrates are grown via hydrochemical deposition from the solution containing thiourea, zinc chloride, manganese chloride, and dimethyl sulfoxide.The ZnS-based luminophores exhibit high brightness and light output in the visible spectrum range.The photoluminescence of ZnSSe:Mn is much more pronounced with a decrease in their dimensions,which is controlled by the manganese and dimethyl sulfoxide contents. Luminescence intensity in different excitation wavelength correlates with different size of ZnSSe:Mn nanocrystals on luminescence spectra. We found that by narrowing the size distribution and doping concentration, ZnSSe:Mn samples can be prepared with high luminescence intensity. These materials are non toxic so they can

be further elaborated for their application in biosensing and imaging. The PL spectra of the ZnSSe:Mn nanocrystal samples show three peaks, at 478, 550 and 655 nm, which are attributed to the band edge, shallow and deep traps, respectively. We see that undoped nanocrystals have a narrower size distribution than the 5% and 10% doping nanocrystals.

The characteristic luminescence can consist of relatively sharp emission bands (spectral width typically a few nm), but also of broad bands, whose width can exceed 50 nm in the visible part of the spectrum. Sharp emission bands are characteristic of optical transitions between electronic states with chemical bonding character (almost) the same for ground and excited states that hardly participate in the chemical bonding. These activities in the host material define the luminescence efficiency and can produce a narrowing or broadening of the band width of the spectra.It was found that the luminescence spectra for all samples could be deconvoluted into two individual components, which corresponded to band edge emission and surface trap state emission. The mechanism of luminescence in ZnSSe:Mn nanostructure can be explained as following: after excitation, energy will be transferred from the conduction band of ZnSSe:Mn host to the excited charge carriers which are trapped in shallow trap states.

OBTAINING PHOTOSENSITIVE THIN FILMS OF COMPOUND $AgIn_5Se_8$

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Formed in the Ag – In - S system, ternary semiconductor compounds $AgInS_2$, $AgIn_5S_8$ and $Ag_3In_5S_9$ possess a number of important physical properties of great practical interest. Compound $AgInS_2$ is known as a strongly luminescent substance. The band gap of a crystal at 295 K is 1.24 eV, the edge of the intrinsic absorption band is formed by direct transitions. The second $AgIn_5Se_8$ compound has a normal spinel structure, and the unit cell parameters are a=5,797Å and

c/a=2,0. $AgIn_5S_8$ crystals are used in optical systems as a polarizer for electromagnetic radiation. Based on the CdS-$AgIn_5S_8$ heterojunction, light-emitting diodes have been fabricated, the radiation spectrum of which covers the weight of the visible radiation range.

Thin films of the $AgIn_5S_8$ compound were obtained by the method of instant thermal evaporation of finely dispersed crystal dust particles in vacuum. This method is technologically implemented in the following order. Polycrystalline $AgIn_5S_8$ was crushed on a grinder into dust particles with dimensions of the order of 100 micrometers. After that, the substance in a certain amount poured into the container of the conveyor, which delivered the substance to the crucible. After obtaining a vacuum in the working chamber up to 0.001 Pa, the crucible was heated to a temperature of 1200 ° C and the conveyor was switched on. The dust particles in the heated crucible instantly evaporated. The precipitated substances on different substrates contained the components of all three compounds $AgInS_2$, $AgIn_5S_8$ and $Ag_3In_5S_9$. However, the bulk of the precipitated substances had a composition. After thermal annealing of thin films in selenium vapor at a temperature of 800 ° C, homogenization of the film composition occurs and the stoichiometric composition corresponds to the $AgIn_5S_8$ formula. Thermal annealing of thin films contributes to an increase in the photosensitivity of the film. The region of photosensitivity of thin films covers the range of 1 ... 1.5 eV of radiation energy. In the temperature range 200 ... 350 K, with increasing temperature, the photosensitivity of the film increases and, over 350 K, thermal quenching of photoconductivity occurs. Both in crystals and in thin films at a temperature of 210 K, photoconductivity stimulated by an electric field appears. $AgIn_5S_8$ thin films were obtained on glass and In_2O_3 substrates and all films had amorphous structures. However, thin films obtained on CdS nanostructures had a polycrystalline structure. CdS nanostructure on a glass substrate was obtained by a modified chemical deposition method. The study of the volt-ampere characteristics of the Ag - $AgIn_5S_8$– CdS - In_2O_3 structure showed a diode character. The heterostructure has a high photosensitivity in the entire wavelength range of visible radiation.

RADIATION DEFECTS INVESTIGATION OF NANO SILICA (SiO_2) PARTICLES USING EPR METHOD

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SiO_2 compound is widely spread in nature as crystalline and amorphous form and has various types of application fields. Thereby, these compounds are widely applied in electronics and technology, especially in cosmic electronics and nuclear technology. Simultaneously, SiO_2 compounds widely applied in nuclear and cosmic electronics and their application in nanoelectronics is inevitable in future. The electronic structure and spectral properties have been study of silica without radiation. In the presented work, it has been reviewed localized electrons in defects practically formed by ionization irradiation. Thence, the main aim in the work is to assess, characterize and determine the defects formed irradiation in the structure of high purity nano SiO_2 particles. Besides this, we can explain also the atomic nature of point defects E'_δ by ESR analysis, according to atomic model of nano SiO_2 powder. The main properties of point defects model in atomic scale are studied by ESR analysis, and the obtained results are compatible to other spectroscopic practical and theoretical results. ESR analyses allow determining these defects in atomic scale and are covering interaction of the mentioned free electrons with wave function (other free electron and nucleus). Thus, it is possible to observe not only the form of neighbouring atoms, as well as paramagnetic interacting centres in crystal field inside the sample. Theoretical and technical information on ESR principles and application can be found in detailed in a number of books and articles. In this paper we are studying the ESR (or electron paramagnetic resonance – EPR) of nano silica compounds exposed to the influence of ionization irradiation at the different periods and initial state (control sample). It has been defined local defects formed as a result of ionization irradiation and electrons stored in these local defects create changes in electrophysical and physical properties of nanoparticles.

CdS/Cu_2ZnSnS_4 STRUCTURE FOR SOLAR CELLS

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A solar cell with CdS/Cu_2ZnSnS_4 structure has been fabricated using all-electrodeposited CdS and Cu_2ZnSnS_4 thin layers. The three semiconductor layers were electrodeposited using a two-electrode system for process simplification. The incorporation of a wide bandgap amorphous ZnS as a buffer/window layer to form$ZnS/CdS/Cu_2ZnSnS_4$ solar cell resulted in the formation of this 3-layer device structure. This has yielded corresponding improvement in all the solar cell parameters resulting in a conversion efficiency >12% under AM1.5 illumination conditions at room temperature.

II-VI group compound semiconductors such as CdS and Cu_2ZnSnS_4 are important because of their photovoltaic, photoelectrochemical, and electroluminescent applications and, thus, they have much attention. Recently, there have been many efforts to produce nanosized materials, because electrical and optical properties can be varied via chemical control over the size, stoichiometry, and interparticle separation. These materials have been synthesized by various techniques including pyrolysis of organometallic compounds and sol gel synthesis. In recent years, there has been considerable interest of using thin films in solar cells. Photoelectrical properties of these heterojunctions have found practical application in phototransistors and in solar cells. However, the physics and technology of heterojunctions have also other prominent aspect - creation, research and practical application of non-ideal heterojunctions. The big set of various effects and phenomena in non-ideal heterojunctions related to various properties of semiconductors on both junction regions of heterocontacts have been observed. Perspectivity of practical application of the non-ideal heterojunctions is related first to more economic technology of creation of polycrystalline heterostructure in comparison with the monocrystalline. One of

directions in studying of the non-ideal heterojunctions is the opportunity of solar cells application based on A^2B^6compaund multilayer structures.

ELIMINATE SOME DIFFICULTIES WHILE OBTAINING Ge-Si BINAR SOLID SOLUTION MONOCRSTALS

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In order to obtain the perfect monocrystals of binary solids by stretching, a certain geometric structure and nourishing alloy with stable composition are often used. This kind of alloy is usually achieved by cool cooling.As a result of mechanical deformations occurring during this time, as the microscopic cracks are formed inside the nutrient, when the nutrients are consumed during crystallization, a smaller crystal particle enclosed by microcracks breaks onto the surface of the liquid. (note that the density of the liquid phase in the solid solutions of the Ge-Si is higher than the density of the solids).The fractured particle moves through the surface because of the tension force, approaching the growing crystal and causing it to form new crystallization centers on the crystallization front.This, in some cases, results in a violation of monocrystalism. Methodological innovations have been used in this study to overcome this disadvantage. For this purpose, the volume of the pitch is divided into two parts with the help of quartz partition, which allows the hole to be placed in the bottom of the partition (inside the liquid) to connect both parts of the liquid space.In one part of the fluid volume, the monocrystals are grown, while the other is for the nutrition of the liquid.When any particle is removed from the nutrient, it moves on the surface of the liquid, and as a result of movement, it can only reachthe partition, and after a while it dissolves into the liquid space.Thus, the deterioration of monocrystal is prevented.It is true that the turning of the crystal itself prevents the

distortion of the temperature field's symmetry. However, a more perfect way to prepare a nourishing alloy has been used in the workto create a more favorable crystallization front and to eliminate extreme cold.

DIELECTRIC PROPERTIES OF NANOCOMPOSITES ON THE BASE OF POLYVINYLCHLORIDE (PVC) AND MAGNETITE NANOPARTICLES (Fe_3O_4).

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Dielectric properties of PVC+Fe_3O_4 based polymer nanocomposites were investigated. It has been established that the dielectric permittivity of PVC-Fe_3O_4 based nanocomposites with different concentrations of Fe_3O_4 nanoparticles decreases depending on the frequency. It has also been established that the inclusion of Fe_3O_4 nanoparticles into the PVC matrix increase of dielectric permittivity of nanocomposites for all concentrations of Fe_3O_4 nanoparticles compared to pure polymer. In small concentrations, Fe_3O_4 nanoparticles play a structural role in the polymer matrix, and in the nanocomposites were created new polar groups and electrical traps for electrical charges, which leads to an increase in the dielectric permeability of nanocomposite, that is, the improvement of the polarization ability of nanocomposites. Also, the increase in the dielectric permability of nanocomposites with the increased of concentration of magnetic nanoparticles Fe_3O_4 is due to the homogenous distribution of nanoparticles in the polymer matrix and the formation of a more regular structure in the polymer. Also it have been established that the dielectric loss of nanocomposites begins to decrease depending on the frequency, and then begins to increase at high frequencies. The increase in dielectric loss at high frequencies is explained by increased relaxation processes and energy scattering.

THERMAL PROPERTIES OF MAGNETIC POLYMER NANOCOMPOSITES BASED ON PVC+Fe_3O_4.

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Have been studiedof thermal properties of PVC-Fe_3O_4 based nanocomposite. The process of destruction of nanocomposites is accompanied by significant energy costs associated with a complete change in the structure of the sample, and proceeds smoothly in time, which indicates the sequential passage of several stages, characterized by a different state of the system. Such a conclusion can be made on the basis of the analysis of the DSC curve and the corresponding peak at a temperature of 295°C. This temperature corresponds to the PVC degradation temperature and it is forbidden to exceed this temperature during work on the composite. The residual mass of the sample upon reaching a temperature of 600°C corresponds to the content of mineral additives in PVC. The thermal degradation of pure PVC takes place in three mass loss stages. The first stage takes place around 230–350 °C, which may be due to the emission of hydrogen chloride (dehydrochlorination), second stage is owing to the thermal cracking of organic materials bonds and the third one in higher temperature region is related to crosslinking. For all nanocomposite films, thermal decompositions occurred at higher temperatures than pure PVC. On heating the pristine PVC decomposes in the temperature range of 250–500°C the first stage is attributed to the elimination of hydrogen chloride molecules followed by the formation of the conjugated polyene sequences, while the second stage to the thermal cracking of the carbonaceous conjugated polyene sequences.

THE IMPURITY STATE OF PROPER DEFECTS IN $Ag_3In_5Se_9$

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One of the features of the physical properties of $Ag_3In_5Se_9$ crystals is manifested in the process of conduction of electric current, in which the electron-phonon interaction plays a decisive role in the mechanism of electrical conductivity. Previously, it was found that about 200 K in a $Ag_3In_5Se_9$ crystal in the direction of the electric field parallel to the "c" axis, with field values above 400 V/cm, under the action of IR radiation, oscillations of the electric current are generated. The reason for the generation of such oscillations was considered to be the dependence of the capture cross-section of current carriers by sticking levels on the electric field and the acoustoelectric effect, caused by the electron-phonon interaction.

The generation of electrical oscillations associated with the Gunn effect is mainly observed in semiconductor crystals of type A^3B^5 and is of great practical interest. However, the observed current oscillations in $Ag_3In_5Se_9$, in contrast to current oscillations in A^3B^5 type crystals, are related to the nature of impurities in the crystal and the influence of the lattice dynamics on the electron-phonon interaction.

In this work, the electrical and photoelectric properties of compound $Ag_3In_5Se_9$ were studied in the temperature range of 300 – 400 K. In the indicated temperature range, the Hall effect method was studied and the temperature dependences of the concentration and mobility of conduction electrons were studied. From the dependence $ln\sigma \sim 1000/T$, the activation energy of current carriers is determined: E_a = 0.87 eV. It is established that the dependence μ(T) in this temperature range refers to the mixed mechanism of carrier scattering on neutral impurity centers and on lattice vibrations.

In thin films of compound $Ag_3In_5Se_9$, the photoconductivity spectra were studied at temperatures of 295 and 390 K. Thin films of $Ag_3In_5Se_9$ at 295 K are photosensitive in the photon energy region of

0.9 – 2.0 eV. The spectrum has a clear quadratic dependence of the long-wave edge with a peak characteristic of the presence of excitons in the film. The peak of the photoconductivity spectrum is located at 1.19 eV, which is comparable with the band gap of the crystal $Ag_3In_5Se_9$ E_g = 1.22 eV.

At 390 K, on the photoconductivity spectrum at the long-wave edge, impurity photoconductivity of about 0.85 eV is observed. This energy of occurrence of the impurity level is in accordance with the activation energy of current carriers, determined from the temperature dependence of electrical conductivity. The detected impurity levels with the same activation energy in crystals and thin films suggest that these impurity centers are intrinsic defects of compound $Ag_3In_5Se_9$. Such defects can be cationic vacancies of the structure, i.e. vacancies of the volatile component of the compound, behaving as neutral impurity centers.

TOWARD REDUSE OF THE LANDAU GHOST POLE IN QUANTUM THEORY

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A short review of problems associated with the unphysical Landau pole in propagators of quantum particles is given. Approaches to eliminating this pole within the framework of electrodynamics and effective theories of strongly interacting particles are investigated. The asymptotic behavior at large momenta in the scalar theory is investigated. The main problem is to develop a recipe for numerical analysis of the solutions of the obtained nonlinear equation for the amplitude at small interaction distances (large values of the momentum) for different values of the constant. The nontrivial behavior of the amplitude in the deeply inelastic region of momenta is determined. The positions of the unphysical poles (the Landau poles) in

the expression for the amplitude in the deeply inelastic region of momenta are identified.

ELECTRICAL CONDUCTIVITY OF $CuInS_2$CRYSTAL IRRADIATED BY THE γ-QUANTUMS

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In this work, effect of γ-quantums to the electrical conductivity of $CuInS_2$ crystal has been investigated. Defects of $CuInS_2$ crystal belong to the donor type and they have n-type conductivity. Investigation of controlling their concentration by the radiation technology method is scientifically interesting γ-quantums were used for this aim. Samples were irradiated at room temperature (300K) and of different doses. Temperature dependence of specific resistance at 77-400K temperature interval was learned. Thermal width of forbidden zone which was determined according to the sloping of temperature region of this dependence is $\Delta E = 0{,}96 \pm 0{,}1$ eV.

Temperature dependence of electrical conductivity in irradiated and non-irradiated samples were learned. It was found out, at the result of irradiation, in the both researched directions, according to the "C" axis, affecting mechanism of radiation defects which formed at the result of the effect of γ-quantums to the electrical conductivity were the same. But nature and source of these defects and interactions between them ignored. These shortcomings were taken into account in the theoretical model of electron structures of vacancies in the compound semiconductors. According to this model, we could say that, changes of electrical conductivity in the doping region at the result of the effect of γ-quantums is connected to the change of charge case of energetic levels which formed by the initial vacancies. Dependence of the specific conductivity ($\sigma_{//C}$, $\sigma_{\perp C}$) of $CuInS_2$monocrystals from doses of γ-quantums in the different directions according to the "C" axis was investigated $CuInS_2$.

LUMINESCENCE PROPERTIES OF CdS:Cu(Mn)NANOPARTICLES

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Nanoscale materials researches have stimulated great interest owing to their importance in basic scientific research and potential technological applications. The synthesis of doped nanocrystals has become a major field of recent researches. CdS:Cu, Mn nanocrystals have been mainly studied due to the luminescence of the Cu^{2+} and Mn^{2+}ions inside the CdS host. An aqueous solution method has been developed for synthesizing size-controlled CdS:Cu (Mn) nanocrystals with a relatively narrow size distribution. The nanocrystal samples were characterized by UV-Vis absorption spectra and photoluminescence spectra. We prepared narrow size distribution particles under different synthesis conditions. The photoluminescence properties CdS:Cu (Mn) was investigated. Luminescence intensity in different excitation wavelength correlates with different size of CdS nanocrystals on luminescence spectra. We found that by narrowing the size distribution and doping concentration, CdS:Cu, Mn samples can be prepared with high luminescence intensity.

The study of the luminescence of Cu particles revealed that T2 levels of Cu atoms play an important role as an irradiation center. Thus, transition from the conductive zone and narrower donor level (sulfur vacancy) to T2 levels gives high intensity luminescence. The first maximum of the spectrum (546 nm) belongs to the donor-acceptor pair in the CdS crystal cage.

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