

National Academy of Sciences of Ukraine
Institute of Physics
G.V.Kurdyumov Institute for Metal Physics
Institute for Information Recording
Uzhgorod laboratory of optoelectronics and photonics materials of the
Institute for Information Recording
Uzhgorod National University

INTERNATIONAL MEETING

**CLUSTERS AND NANOSTRUCTURED
MATERIALS
(CNM-5)**

**Uzhgorod *Vodograj* Ukraine,
22-26 October 2018**

**PROGRAM & MATERIALS
OF THE MEETING**

**Uzhgorod
2018**



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The materials represent the contents of meeting's reports based on the results of fundamental and applied works on topical questions in the field of nanostructured systems, nanomaterials and nanotechnologies. Main attention is given to the consideration of problems of nanophysics and nanoelectronics, to atomic and electronic structure of cluster and nanostructured materials, amorphous alloys, nanostructured films and coatings, colloidal and biofunctional materials, to study of their properties. The results of investigations in the field of supramolecular chemistry, synthesis of nanoparticles, nanostructures and multifunctional nanomaterials, physico-chemistry of superficial phenomena and diagnostics of nanosystems are presented.

The edition is designed for scientists, engineers, higher school lecturers, post-graduates and students of corresponding specialities.

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PROGRAM



MONDAY, 22TH OF OCTOBER, 2018

8⁰⁰ – 13⁰⁰ – registration of CNM'5 participants, coffee-break

13⁰⁰ – 14⁰⁰ – lunch

15⁰⁰– 15³⁰ – Opening MEETING (official speakers)

PLENARY

Chairman: **Studenjak I.**

15³⁰ – 16²⁰ – **NANODIMENSIONAL SYSTEMS: INVESTIGATIONS FND
DEVELOPMENT IN THE NATIONAL AKADEMY OF SCIENCE OF
UKRAINE**

Uvarov V.M., Malchevskii I.A., Bespalov S.A.

16²⁰ – 17¹⁰ – **USING A DIRECT LASER RECORD TO CREATE SUB-MICRON
STRUCTURES**

Petrov V.V., Kryuchyn A.A., Shanoylo S.M., Beliak Ie.V., Manko D.Yu.,
Gorbov I.V. .

17¹⁰ – 18⁰⁰ – **FERROELECTRIC NANO-STRUCTURES FOR ULTRAFAST THZ
COMMUNICATIONS, LOW-DISSIPATION ELECTRONICS, AND
MULTI-LOGIC COMPUTING CIRCUITS**

Igor Lukyanchuk, Daoud Mezanne, Anna Razumnaya, Yuri Tikhonov,
Elena Zaitseva, Vitaly Levashenko

19⁰⁰ – 20⁰⁰ – dinner



TUESDAY, 23TH OF OCTOBER, 2018

8⁰⁰ – 9⁰⁰ – breakfast

PLENARY

Chairman: **Malchevskii I.**

9⁰⁰– 9⁵⁰ – **PHONON SPECTRUM OF COMPOSITE OXIDE SYSTEMS OF THE PEROVSKITE FAMILY IN THE CONCEPT OF SUPER SPACE SYMMETRY**

Shkyrta I. M., **Nebola I. I.**, Katanitsa A. F., Ochkaev I. I.

9⁵⁰– 10⁴⁰ – **SEMICONDUCTORS – FERROICS OF PHOSPHOROUS CHALCOGENIDES FOR VERY DENSE AND FAST MEMORY ELEMENTS**

Vysochanskii Yu., Haborets V., Yevych R., Glukhov K., Babuka T., Medulych M., Kohutych A., Molnar A.

10⁴⁰ – 11¹⁰ – coffee-break

PLENARY

Chairman: **Vysochanskii Yu.**

11¹⁰ – 12⁰⁰ – **NEW NONLINEAR NON-STATIONARY OPTICAL PHENOMENA IN THE INTERACTION OF ULTRASHORT LIGHT PULSES WITH MATERIALS FOR OPTOELECTRONIC AND TELECOMMUNICATION USE: FUNDAMENTAL AND APPLIED ASPECTS**

Blonskyi I.V., Kadan V.M., Dmytruk A.M., Dmitruk I.M., Korenyuk P.I., Pavlov I.A., Pavlova S.V., Rybak A.S., Shpotyuk O.I., Yarusevych O.I.

SECTION

12⁰⁰ – 12²⁰ – **GRAPHENE-LIKE MATERIALS AND NANOCOMPOSITES BASED THEREON: MECHANOCHEMICAL PREPARATION, STRUCTURE, PROPERTIES AND FUNCTIONAL APPLICATION**

Posudievsky O.Yu., Kondratyuk A.S., Kozarenko O.A., Koshechko V.G., Pokhodenko V.D.

12²⁰ – 12⁴⁰ – **HIGH TEMPERATURE PLASMONS AND CARRIER MOBILITY SIMULATION IN n-type WIDE HgTe QUANTUM WELLS**

Melezhik E.O., Gumenjuk-Sichevska J.V., Mikhailov N.N.

12⁴⁰ – 13⁰⁰ – **NANOCLASTERS IN HEA COATING**

Danylenko M.I., Gorban' V.F., Krapivka M.O., Firstov S.O.

13⁰⁰ – 14⁰⁰ – lunch



SECTION

Chairman: **Uvarov V.**

14⁰⁰ – 14²⁰ – THE ALUMINUM METALOTERMIC ALLOYS

Zhiguts Yu.Yu., Lazar V.F., Levdar K.E.

14²⁰ – 14⁴⁰ – METHOD OF DETERMINATION OF PHASE COMPOSITION OF SYNTHESIZED ALLOYS BY THE METHODS OF GEOMETRIC THERMODYNAMICS

Zhiguts Yu.Yu., Polishchuk O.S., Beyresh Ya.Ya.

14⁴⁰ – 15⁰⁰ – PROPERTIES OF CLUSTERED METAL AND HIGH-ENTROPY ALLOY COATINGS TiZrHfVNbTa

Gorban V.F., Andreev A.A., Firstov S.A., Chikryzhov A.M., Stolbovoy V.A., Krapivka N.A.

15⁰⁰ – 15³⁰ – coffee-break

SECTION

Chairman: **Kokenyesi S.**

15³⁰ – 15⁵⁰ – STRUCTURE AND PROPERTIES OF NANOCRYSTALLINE COPPER- AND ALUMINUM-BASED CONDENSATES

Zhadko M.A., Lutsenko E.V., Sobol' O.V., Zubkov A.I.

15⁵⁰ – 16¹⁰ – SUPERCONDUCTIVITY OF GASB MICROCRYSTALS AT WEAK MAGNETIC FIELDS

Druzhinin A.A., Ostrovskii I.P., Khoverko Yu.M., Liakh-Kaguy N.S.

16¹⁰ – 16³⁰ – PHOTOCATALYTIC PROPERTIES OF POLYSULFONIC MEMBRANES MODIFIED WITH SnO₂ NANOPARTICLES

Kolesnyk I., Dzhodzhyk O., Konovalova V., Burban A.

16³⁰ – 16⁵⁰ – SPHEROIDAL MULTILAYER NANOSCALE CARBON CLUSTERS - POLYFUNCTIONAL FUEL ADDITIVES OF NEW GENERATION

Polunkin Ye.V., Gaidai O.O., Bereznitskyi Ya.O., Pilyavskyi V.S., Kamenieva T.M.

16⁵⁰ – 18⁰⁰ – POSTER SECTION (DISCUSSION)

19⁰⁰ – 20⁰⁰ – dinner

WEDNESDAY, 24TH OF OCTOBER, 2018

8⁰⁰ – 9⁰⁰ – breakfast

PLENARY

Chairman: **Bespalov S.**

9⁰⁰– 9⁵⁰ – **DEVELOPMENT OF FUNCTIONAL POLYMER NANOCOMPOSITES FOR DIRECT OPTICAL RELIEF RECORDING**
Molnar S., Burunkova J., Bohdan R., Bako J., Daroczi L., **Kokenyesi S.**

9⁵⁰ – 10²⁰ – **INFLUENCE OF TECHNOLOGICAL FACTORS AND THERMAL TREATMENT ON THE STRUCTURE AND PROPERTIES OF CHALCOIODIDE GLASSES AND NANO-, MYCROCOMPOSITES ON THEIR BASIS**
Rubish V.M., Rizak I.M., Mykaylo O.A., Maryan V.M., Gorina O.V., Gasinets S.M.

10²⁰ – 10⁵⁰ – coffee-break

SECTION

Chairman: **Rubish V.**

10⁵⁰ – 11¹⁰ – **SELF-ORGANIZATION OF CRACKING IN THIN FILMS OF CHALCOGENIDE GLASS As₂S₃**
Kozak M.I., Loya V.Yu., Zhikharev V.N., Fedelesh V.I.

11¹⁰ – 11³⁰ – **MAGNETICALLY SENSITIVE NANOCOMPOSITES BASED ON MAGNETITE AND GEMCITABINE FOR APPLICATION IN ONCOLOGY**
Petranovska A.L., Abramov M.V., **Opanashchuk N.M.**, Turanska S.P., Kussyak N.V., Gorbyk P.P., Lukyanova N.Yu., Chekhun V.F.

11³⁰ – 11⁵⁰ – **SELF –ORGANIZED HETEROSTRUCTURES INORGANIC CARRIER – NATIVE ENZYME MIXTURE AND THEIR ELECTROCHEMICAL APPLICATIONS**
Kazdobin K.A., Pershina K.D., Khodykina M.O., Trunova E.K., Bepaliuk A.A.

12⁰⁰ – 13⁰⁰ – lunch

PLENARY

Chairman: **Mykaylo O.**

13³⁰ – 14⁰⁰ – **THE EFFECT OF VACANCIES ON CHARACTERISTICS OF METAL CLUSTERS**
Pogosov V.V., Reva V.I., Korotun A.V.



14⁰⁰ – 14³⁰ – NEWTYPE RECORDING MEDIA BASED ON “NOBLE METAL NANOPARTICLES/ChVS FILMS” COMPOSITIES

Rubish V.M., Trunov M.L., Lytvyn P.M.

**14³⁰ – 19⁰⁰ – POSTER SECTION (DISCUSSION)
EXCURSION**

19⁰⁰ – 20⁰⁰ – dinner



THURSDAY, 25TH OF OCTOBER, 2018

8⁰⁰ – 9⁰⁰ – breakfast

SECTION

9³⁰– 12³⁰ – Satellite conference ACCELERATE

Chairman: **Rizak V.**

CERIC-ERIC, THE MULTI-TECHNIQUE RESEARCH INFRASTRUCTURE FOR MATERIALS RESEARCH IN CENTRAL-EASTERN EUROPE

Matthias Girod

TEACHER OF PHYSICS AND INNOVATION CHANGES IN SLOVAK SCHOOL EDUCATION

Seben Vladimir

"HORIZON" OF DEVELOPMENT AND INNOVATION FOR UzhNU AND TRANSCARPATIA

Taisiya Symochko

XPS, SRPES, LEED AND NEXAFS INVESTIGATION OF ADENINE THIN FILM ON TITANIUM OXIDE SURFACES

V. Matolin A. Barta, S. Bercha, N. Popovych, N. Tsud, T. Duchon, K. Veltruska, I. Khalakhan, V. Rizak

X-RAY STUDY OF ELECTROCHEMICAL STERN LAYER: ORDERING AND LAYERING

Yihua Liu, Tomoya Kawaguchi, Michael S. Pierce, **Vladimir Komanicky**, Hoydoo You

HIGH-PRESSURE SINGLE-CRYSTAL SYNCHROTRON DIFFRACTION STUDY OF LIKB₄O₇

L. Dubrovinsky, I. Chobal, A. Pakhomova, O. Chobal, D. Simonova, A. Kurnosov, V. Adamiv, V. Rizak

NEAR-AMBIENT PRESSURE XPS STUDIES OF THE CATALYTIC AND GAS SENSING PROPERTIES OF COPPER AND TIN OXIDES

Vorokhta M., Khalakhan I., Hozák P., Vrnáta M., Vondráček M., Lančok J., Matolín V.

INFLUENCE AMMONIA AND HUMIDITY ON THE LUMINESCENCE OF QUANTUM DOTS IN NANOCOMPOSITE STRUCTURES BASED ON BACTERIOHODOPSIN

S. O. Korposh, I. I. Trikur, I. Y. Tsoma, M.Y. Sichka, V. M. Rizak

MICRO- AND NANOSIZED PROTECTIVE ELEMENTS ON As-Se AND Ge-As-Se THIN FILMS

A. Feher, B.V. Bilanych, O. Shylenko, V. Komanicky, V.S. Bilanych, I.M. Rizak, V.M. Rizak



13⁰⁰ – 14⁰⁰ – lunch

PLENARY

Chairman: **Mitsa V.**

14³⁰ – 15²⁰ – ON THE DERIVATION OF THE DIRAC EQUATION

Simulik V.M., Bulgakova A.I., Zajac T.M.

15²⁰ – 16¹⁰ – CARBONIZATION PROCESSES AND FORMATION OF METAL NANOPARTICLES IN ION-IRRADIATED POLYMERS AND COMPOSITE MATERIALS: POSITRON ANNIHILATION SPECTROSCOPY APPROACH

Kavetsky T. and Kiv A.

16¹⁰ – 16⁴⁰ – coffee-break

SECTION

Chairman: **Kavetsky T.**

16⁴⁰ – 17⁰⁰ – THE FLASH-LAMP TREATMENT OF THE Cu₂ZnSnS₄ NANOCRYSTALS AND THE RAMAN CHARACTERIZATION OF POSSIBLE SECONDARY PHASES SYNTHESIZED BY THE SAME METHOD

Havryliuk Ye.O., Dzhagan V.M., Yukhymchuk V.O., Valakh M.Ya.

17⁰⁰ – 17²⁰ – DFT-CALCULATIONS OF THE STABILITY AND RECONSTRUCTION OF THE CRYSTAL SURFACE

Nykyruy L.I., Naidych B.P.

17²⁰ – 18⁰⁰ – POSTER SECTION (DISCUSSION)

19⁰⁰ – 20⁰⁰ – dinner



FRIDAY, 26TH OF OCTOBER, 2018

8⁰⁰ – 9⁰⁰ – breakfast

PLENARY

Chairman: **Uvarov V.**

9⁰⁰– 9⁵⁰ – COORDINATION DEPENDENCE OF BOSON PEAK POSITION AND CRYOGENIC THERMAL ANOMALIES IN NANOSTRUCTURED As_xS_{100-x} GLASSES

V. Mitsa, A. Feher, V. Tkáč, R. Holomb, M. Veres, N. Shumilo

9⁵⁰ – 10⁴⁰ – NANOSTRUCTURED UREASIL-BASED POLYMER COMPOSITES FOR CONSTRUCTION OF AMPEROMETRIC ENZYME BIOSENSORS: STATE-OF-THE-ART AND FUTURE OUTLOOK

Kavetskyy T.

10⁴⁰ – 11¹⁰ – coffee-break

11¹⁰ – Closing MEETING

POSTERS

- **OBLIQUE LOCALIZED JOSEPHSON PLASMA WAVES IN A PLATE OF LAYERED SUPERCONDUCTOR**
 Shymkiv D.V., Rokhmanova T., Maizelis Z.A., Kadygrob D.V., Apostolov S.S.
- **NANOCOMPOSITES OF GRAPHENE-LIKE CARBON AND COBALT OXIDES FOR CATALYTIC HYDROGENATION OF QUINOLINE**
Asaula V. N., Pariiska O. O., Ryabukhin S. V., Gavrilenko K.S.,
 Volochnyuk D. M., Kolotilov S. V.
- **ELECTRONIC AND VIBRATIONAL PROPERTIES OF Cu(Ag)InP₂S(Se)₆ CRYSTALS: THEORETICAL INVESTIGATION**
Babuka T., Glukhov K., Vysochanskii Yu., Makowska-Janusik M.
- **METHOD FOR IDENTIFICATION OF OPTICAL RESONANCES OF METAL FILMS**
Barabash M.Yu., Vlaykov G.G., Martynchuk V.E., Kolesnichenko A.A.,
 Rybov L.V.
- **INVESTIGATIONS OF MECHANICAL PROPERTIES IN Cu₆PS₅I-BASED THIN FILMS**
Bendak A.V., Bilanych V.V., Skubenych K.V., Bilanych V.S., Studenyak I.P.
- **EFFECT OF GREEN BODY ANNEALING ON LASER PERFORMANCE OF YAG:Nd³⁺ CERAMICS**
Bezuglyi V.A., Yavetskiy R.P., Parkhomenko S.V., Vorona I.O., Tolmachev A.V., Kosyanov D.Y., Kuryavyi V.G., Mayorov V.Y., Gheorghe L., Croitoru G., Enculescu M.
- **MAGNETO - INDUCED ANISOTROPY IN A MAGNETOACTIVE ELASTOMER**
A. V. Bodnaruk, A. Brunhuber, A. A. Snarskii, M. M. Kulyk, V. M. Kalita, S. M. Ryabchenko and Mikhail Shamonin
- **Hg₃Te₂Cl₂ AS AN EFFICIENT NANOMATERIAL FOR NONLINEAR OPTICAL APPLICATIONS**
 Bokotey O.V., Slyvka V.A., Bokotey O.O., Slivka A.G.
- **ON THE STRUCTURAL AND OPTICAL PROPERTIES OF TERNARY THALLIUM CHALCOGENIDE COMPOUNDS**
Bokotey O.V., Slivka A.G.



- **HIGH-TEMPERATURE ELECTROCHEMICAL SYNTHESIS OF MOLYBDENUM CARBIDE NANOSTRUCTURED COATINGS ON THE SURFACES OF DIELECTRICS AND SEMICONDUCTORS IN IONIC MELTS**

Gab A.I., Shakhnin D.B., Lukashenko T.F., Boliukh O.S., Malyshev V.V.
- **COMPOSITE POLYMER FIBERS COATED WITH NANOSTRUCTURED INORGANIC PARTICLES: SYNTHESIS AND APPLICATION**

Bondar Yu., Kuzenko S., Slivinsky V.
- **LUMINESCENT PROPERTIES OF YTTRIUM OXIDE NANOPOWDERS**

Burlak G., Vilinskaya L.
- **PORPHYRINS WITH PERIPHERAL SUBSTITUENTS AS INHIBITORS OF AMYLOID FIBRIL FORMATION**

Kovalska V., Chernii S., Losytskyy M., Kelm A., Yarmoluk S., Gorski A., Chernii V.
- **SYNTHESIS OF PHOTOCATALYTIC ZnO NANOMATERIALS FORM DIFFERENT ROUTES**

Danilenko I., Gorban O., Volkova G., Glazunova V., Burkhovetsky V., Bryukhanova I., Konstantinova T.
- **INVESTIGATION CRYSTALLIZATION KINETICS OF Ge-As-TE AND As-S (Sb) -I SYSTEM FILMS USING OPTICAL METHOD**

Turianytsia I.I., Tsyhyka V.V., Kozusenok O.V., Chychura I.I. Slavik V.M.
- **OBTAINING A SUBMICROCRYSTALLINE ZR-TI-NB ALLOY USING HIGH PRESSURE TORSION**

Kulagin R., Mazilkin A., Beygelzimer Y., Savvakina D., Zverkova I., Oryshych D., Davydenko O.
- **IMPROVEMENT OF THE METHOD OF SINGLE OPTICALLY ACTIVE DEFECTS ACTIVATION IN 4H-SIC**

Demenskyi O. M., Glukhova V. I., Krasnov V. A., Shutov S. V., Yerochin S. Yu.
- **THE EFFECT OF EXTERNAL FACTORS ON THE STRUCTURAL, PHYSICAL AND CHEMICAL PARAMETERS OF WATER**

S.O. Dolenko, H.M. Kravchenko, M.D. Skilska
- **INTERACTION OF ELECTRONS WITH NANOCLUSTERS OF ATOMIC AND MOLECULAR GASES**

Doronin Yu.S., Danylchenko O.G., Konotop O.P., Tkachenko A.A., Vakula V.L.



- **THERMAL DIFFUSIVITY EVALUATION AND SEIRA-SPECTROSCOPY OF EXPANDED GRAPHITE - CARBON NANOTUBES COMPOSITES**

Morozovsky N. V., Barabash Yu. M., Dovbeshko G. I., Grebelna Yu. V., Kartel M. T., Sementsov Yu. I.
- **MASS-SPECTRUM AND EVAPORATION MECHANISM OF AS-S GLASSES**

Ivanitsky V.P., Kryshenik V.M., Kolinko S.O.
- **INVESTIGATION OF THE INFLUENCE OF GEOMETRY AND TECHNOLOGICAL PARAMETERS OF PRODUCTION ON THE STRUCTURE AND PROPERTIES OF SPHERICAL CELLULAR STRUCTURES OBTAINED BY SLM**

Travyanov A.Y., Petrovskiy P.V., Cheverikin V.V., Sokolov P.Yu., Davidenko A.A., Fartushna I.V.
- **KINETICS OF DISPERSION DURING ANNEALING IN VACUUM OF NIOBIUM AND HAFNIUM NANOFILMS DEPOSITED ONTO NONMETALLIC MATERIALS**

Gab I.I., Stetsyuk T.V., Kostyuk B.D., Naidich Y.V.
- **INFLUENCE OF LOW TEMPERATURE ANNEALING ON CRYSTALLIZATION PROCESSES IN $(As_2S_3)_{100-x}(SbSI)_x$ GLASSES**

Gasnets S.M., Gorina O.V., Horvat Yu.A., Rizak I.M., Solomon A.M., Shpyrko G.M., Bandurin Yu.A.
- **FERROELECTRICITY IN UNDOPED BINARY OXIDES**

Glinchuk M. D., Kalinin S. V. and Morozovska A. N.
- **TEMPERATURE DEPENDENCE OF RAMAN-ACTIVE MODES OF $TlIn(S_{0.95}Se_{0.05})_2$ SINGLE CRYSTAL**

Gomonnai O.O., Ludemann M., Gomonnai A.V., Roman I.Yu., Guranich P.P., Slivka A.G., Zahn D.R.T.
- **Ag-DECORATED WIDE GAP OXIDES**

Gorban O., Danilenko I., Volkova G., Gorban S., Akhkozov L., Bryukhanova I., Konstantinova T.
- **NANOSTRUCTURED WEAR-RESISTANT SURFACE LAYERS Cu-Fe-O**

Grypachevskiy O.M., Tykhonovych V.V., Uvarov V.M.
- **STRUCTURAL PROPERTIES AND CHEMICAL COMPOSITION OF THE MICRO- AND MESOPOROUS ACTIVATED CARBON SURFACE**

Guzenko N.V., Lodewyckx P., László K.



- **STRUCTURAL AND OPTICAL STUDY OF $(\text{Ge}_{40}\text{S}_{60})_{100-x}\text{Bi}_x$ THIN FILMS PREPARED BY THERMAL EVAPORATION**

Horvat H., Khalakhan I., Vlcek M., Rizak V.
- **INFLUENCE OF INTRINSIC POINT DEFECTS ON THE ELECTRONIC STRUCTURE, PHOTOELECTRIC AND PHOTOLUMINESCENCE PROPERTIES OF GeSe_2**

Bletskan D. I., Kabatsii V. N., Vakulchak V.V., Cheryanyk D.R.
- **DYNAMICAL AND ELASTIC PROPERTIES CHANGES INDUCED BY SUBSTITUTIONAL IMPURITIES IN β - InSe QUASI-TWO-DIMENSIONAL CRYSTALS**

Kharkhalis L.Yu., Glukhov K.E., Babuka T.Ya., Lyakh M.V.
- **MULTIFUNCTIONAL NANOSTRUCTURED COATINGS, DEPOSITED BY VACUUM-ARC METHOD**

Klimenko I.O., Belous V.A., Ovcharenko V.D., Kuprin A.S.
- **STRUCTURAL TRANSFORMATION OF As_2S_3 CHALCOGENIDE MATERIALS BY DOPING OF Mn AS PROSPECTIVE MATERIALS FOR THE NANOOPTICS AND COMPUTER ENGINEERING**

Kondrat O., Holomb R., Csik A., Takats V., Kondrat O., Shumylo N., Ihnatolia P., Olashyn D., Veres M., Paiuk O., Stronski A.V. and Mitsa V.M.
- **THE DIPOLE POLARIZABILITY OF AN ELLIPSOIDAL BIMETALLIC NANOPARTICLE**

Korotun A. V., Koval' A. O. and Kurbatsky V. P.
- **SUBDIFFUSION IMPEDANCE OF STRUCTURES WITH QUANTUM ENERGY ACCUMULATION MECHANISM BASED ON SUPRAMOLECULAR ENCAPSULATED GaSe**

Kostrobij P., Grygorchak I., Ivashchyshyn F., Markovych B., Viznovych O., Tokarchuk M.
- **THE CHEMICAL POTENTIAL AND THE WORK FUNCTION OF A METAL FILM ON A DIELECTRIC SUBSTRATE**

Kostrobij P., Kurylyak I., Markovych B.
- **TUNGSTEN AND MOLYBDENUM CARBIDE NANOSTRUCTURED POWDERS AND COATINGS OBTAINING BY MOLTEN SALTS ELECTROLYSIS**

Malyshev V.V., Shakhnin D.B., Gab A.I., Zalubovskyi M.G., Kovtoniuk A.V.
- **CALCULATING METHOD OF THE EVAPORATION PROBABILITY OF CHALCOGENIDE GLASSES VAPOUR CLUSTERS**

Kovtunencko V.S.



- **2D-MATERIALS BASED ELECTROCATALYSTS FOR HYDROGEN EVOLUTION AND OXYGEN REDUCTION**

Kozarenko O. A., Kondratyuk A.S., Posudievsky O.Yu, Koshechko V.G., Pokhodenko V.D.
- **PRESENTATION DEVELOPMENT OF INSTITUTE FOR INFORMATION RECORDING IN THE FIELD OF HIGH TECHNOLOGY IN THE INSTITUTE SITE**

Kryuchyn A.A., Solonina N.V.
- **INTERACTION OF POLYMETHINE DYES WITH DETONATION NANODIAMONDS IN AQUEOUS SOLUTIONS**

Kulinich A. V., Ishchenko A. A., Mchedlov-Petrossyan N. O., Kamneva N. N., Ōsawa E.
- **INFLUENCE OF NATURAL MINERALS NANOPARTICLES ON THE SYNTHESIS OF BIOLOGICALLY ACTIVE COMPOUNDS BY BACTERIA-COMPONENTS OF THE PREPARATION AZOGRAN**

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- **STUDYING THE $\text{Ge}_{40}\text{S}_{60}$ AND $\text{Ge}_{40}\text{Se}_{60}$ SYSTEMS USING THE X-RAY DIFFRACTOMETRY TECHNIQUE**

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POSSIBILITIES FOR USE OF DILATOMETRY FOR IDENTIFICATION OF NANOSTRUCTURAL CHANGES IN VITREOUS MATERIALS

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Properties of vitreous materials, as is known, are determined not only by their chemical composition, but also essentially depend on the conditions of preliminary heat treatment. The quenching of a metastable melt, annealing, cooling at different rates affects the physical and chemical properties of inorganic glasses, apparently due to structural changes occurring at the nanometric and submicron levels. Identification of these changes is possible due to both direct methods of structural analysis (diffraction methods, electron microscopy), and spectrophotometric methods of research. However, information on the presence or absence of changes in the structure of glass of given chemical composition, depending on the heat treatment, can be obtained also due to such a macroscopic analysis method as dilatometry.

This paper discusses the possibilities of using dilatometry to identify structural changes in the binary chalcogenide glasses of the As-S, Ge-S, and Sb-S systems. The conclusions obtained on the basis of measurements of the temperature dependences of the relative elongation $\Delta l / l (T)$ of these materials with the results of the analysis of their structure by the methods of infrared and Raman spectroscopy are compared.

Despite the diversity of compositions, the course of dependences $\Delta l / l (T)$ at various rates of linear heating reveals a number of general patterns. The interpretation of the temperature-time dependences of relative elongation of samples was carried out within the framework of the glass transition relaxation model, which in particular, operates with the notion of the structural temperature T_s , which corresponds to the temperature of the metastable melt, whose structure is fixed in this glass. Dilatometric measurements allow us to determine not only the coefficients of linear thermal expansion (CLTE), characteristic temperatures of the glass transition interval, but also to draw conclusions about the identity or difference of the structure of samples of the same composition, depending on the heat treatment.

For glass that can only be obtained in the melt tempering mode, a feature has been identified that consists of a significant difference in the CLTE of specimens with different thermal backgrounds, for example, CLTE GeS_2 varies from $8.0 \cdot 10^{-6}$ to $12.0 \cdot 10^{-6} \text{ K}^{-1}$.

According to the analysis of the obtained data, the following conclusions were made:

- the softening temperature T_g can be defined as the minimum structural temperature of the stabilized glass ($T_g = T_{S\text{min}}$);
- the effect of glass softening is related to the achievement of a certain critical volume, which for stabilized glasses is achieved at T_g , for tempered – at temperatures of order of $0.85 \cdot T_g$;
- for tempered glasses the T_g parameter has no content, since their structural temperature exceeds the minimum.

It is shown, that as a result of variations in the processes of heat treatment of glass of this composition there are significant changes in the temperature dependences of relative elongation of samples caused by the modification of their structure, moreover, in many cases this modification can not be registered even by spectrophotometry methods.