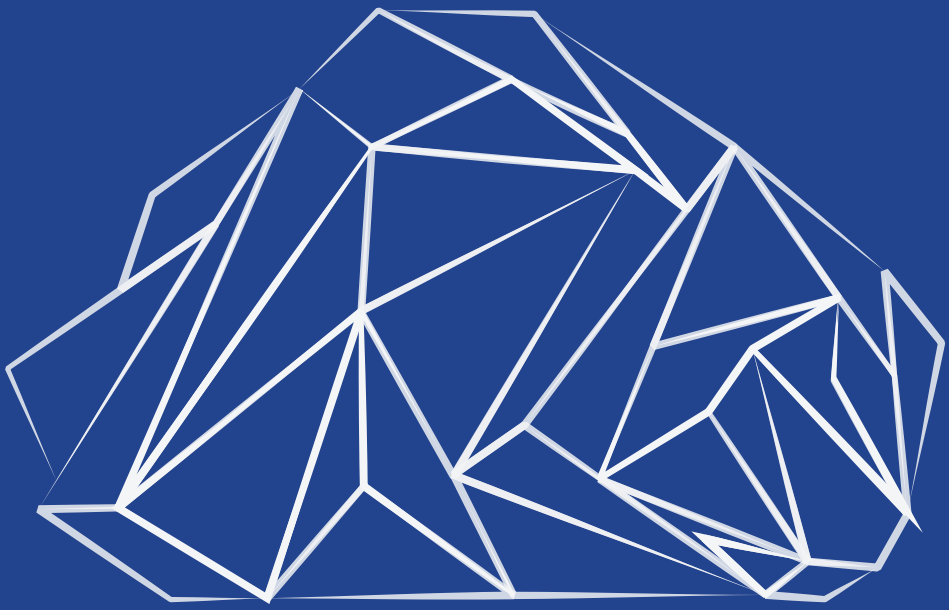

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SUMMARY

13 - 17 october 2025
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Спонсоры конференции

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ФИЛИАЛ ФЕДЕРАЛЬНОГО ГОСУДАРСТВЕННОГО БЮДЖЕТНОГО УЧРЕЖДЕНИЯ
«ПЕТЕРБУРГСКИЙ ИНСТИТУТ ЯДЕРНОЙ ФИЗИКИ ИМ. Б.П. КОНСТАНТИНОВА
НАЦИОНАЛЬНОГО ИССЛЕДОВАТЕЛЬСКОГО ЦЕНТРА «КУРЧАТОВСКИЙ ИНСТИТУТ» —
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ЧЕТВЕРТАЯ РОССИЙСКАЯ КОНФЕРЕНЦИЯ
С МЕЖДУНАРОДНЫМ УЧАСТИЕМ

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DEVELOPMENT AND STUDY OF OPTICAL PROPERTIES OF YTTERBIUM FIBERS BASED ON MULTICOMPONENT SILICATE GLASSES

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A new multicomponent matrix B_2O_3–Al_2O_3–P_2O_5–SiO_2 for the production of ytterbium optical fibers with a core refractive index lower than that of undoped quartz glass is proposed for the first time. The introduction of boron significantly reduced the core refractive index and made it possible to produce a low-mode 20/125 μm optical fiber promising for the cladding-pumped amplifier circuit.

DEPENDENCE OF REFRACTIVE INDEX PROFILES OF SILICA-BASED FIBER GUIDES ON THE COMPOSITION OF THE CORE AND THE TECHNOLOGICAL PARAMETERS OF THE PRODUCTION PROCESSES

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The dependences of the refractive index in silica-based optical fibers and preforms on the core composition (binary and multicomponent) and process parameters are investigated. The analysis of the differences in optical properties is carried out taking into account the structure of the core glasses, the thermal history of the samples and the influence of stresses arising in them.

MODERN METHODS OF STATISTICAL PHYSICS OF LIQUIDS AND GLASSES

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The main trends in the development of statistical physics of liquids and glasses based on the method of partial distribution functions are considered. In particular, for a molecular system interacting with a solid surface by means of elastic collisions, a single-particle distribution function is calculated, which allows to calculate the chemical potential and other thermodynamic quantities. The replica theory for the microscopic theory of glasses is analyzed.

OBTAINING TRANSPARENT QUARTZ GLASS PRODUCTS BY MEANS OF ADDITIVE TECHNOLOGIES

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This paper shows the possibility of using additive technologies to produce transparent silica glass components. The dependence of the viscosity and the shrinkage of liquid glass composite on the powder glass filling was investigated. It was shown that it is possible to obtain transparent silica glass samples at sintering temperatures below 1200°C.

USING PHOSPHORUS-SILICATE GLASS AS A GETTER TO INCREASE THE EFFICIENCY OF SOLAR CELLS

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This paper presents results on the using of gettering by phosphorus diffusion and the growth of phosphorus-silicate glass (PSG) on the surface of n-type Si wafers. It is shown that the use of gettering wafers in the fabrication of a solar cells by heterojunction technology (HJT) allows to obtain a gain in efficiency at the level of 0.2 abs.%, relative to standard HJT cells. To understand the mechanisms of the gettering, the properties of the formed PSG have been analyzed.

EUROPEAN ART NOUVEAU GLASS. MAIN GLASS DECORATION TECHNOLOGIES AT THE TURN OF THE 19TH – 20TH CENTURIES

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The end of the 19th – beginning of the 20th centuries are the heyday of artistic glassmaking. Researchers usually consider glass products in a historical and artistic context. In this study, we present a brief overview of the main technological processes used at that time in Europe and Russia.

NEW FUNCTIONAL COMPOSITE GLASS MATERIALS FOR PHOTONICS AND MICROELECTRONICS

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Review of the own developments of new composite materials for photonics and microelectronics obtained using the silicate porous glass matrices have been presented. Chemical and phase composition, spectral optical and luminescent properties of the synthesized photoluminophores, as well the characteristics of the magnetic state of composites with bimagnetic properties were been studied.

EFFECT OF ELEMENTAL COMPOSITION AND DENSITY OF OPTICAL GLASSES ON THEIR QUANTITATIVE CHARACTERISTICS OF X-RAY AND GAMMA-RADIATION ATTENUATION

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The aim was to reveal factors which determine coefficients of radiation attenuation (CRA) by optical glasses. In the range of energy quanta from 0.2 to 1.0 MeV glass composition has a high effect on the CRA whereas in the range from 1.0 to 3.0 MeV this effect becomes much smaller. For the majority of glasses, the CRA at each energy of quanta increase linearly with the glass density when going from one glass to another. Formulas were derived which describe these dependencies.

QUARTZ RAW MATERIALS OF UZBEKISTAN: DEPOSITS AND ENRICHMENT METHODS

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Research of quartz deposits of Uzbekistan, chemical and mineralogical composition allowed developing complex enrichment technology of quartz sands, quartzites and vein quartz. Enriched vein quartz of Samarkand deposit is recommended for obtaining glass with high transparency, and quartz sands of deposits of Djeroy, Qulantai, Yakkabog – for obtaining products with high transparency.

RELATIONSHIP BETWEEN STRUCTURE AND OPTICAL SPECTRA OF Ce_2O_3–Li_2O–B_2O_3 MELTS

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Reflectance absorption spectroscopy was used to study Ce_2O_3–$x$$Li_2O$–(99-$x$)$B_2O_3$ melts ($0<x<50$ mol%). The experimental spectra were compared with those calculated from atomic structures obtained by molecular dynamics simulations with machine learning potential. The relationship between the different local environments of Ce^{3+} ions and the absorption spectral features was revealed.

NEW SOLID SOLUTIONS OF GLASS-FORMING SYSTEM M_2O–$M`_2O$–$ZnO$–$P_2O_5$ (M, M` – Cs, Rb, K)

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$Rb_2Zn_3(P_2O_7)_2$ (sp. gr. $P2_1$) is one of the effective nonlinear optical (NLO) crystals of deep ultraviolet and is of interest for the production of UV lasers. In the glass-forming system

M_2O – $M`_2O$ – ZnO – $P_2O_5$ (M, M` – Cs, Rb, K) new solid solutions based on the $Rb_2Zn_3(P_2O_7)_2$ structure were obtained in the following concentration ranges: $K_{2-x}Rb_xZn_3(P_2O_7)_2$ at $0.6 \le x \le 2.0$, $Cs_{2-x}Rb_xZn_3(P_2O_7)_2$ at $1.6 \le x \le 2.0$ and $K_{2-x}Cs_xZn_3(P_2O_7)_2$ at $0.4 \le x \le 0.6$.

THERMODYNAMIC PROPERTIES OF THE $SrO–BaO–Al_2O_3–SiO_2$ SYSTEM BY HIGH-TEMPERATURE MASS SPECTROMETRY

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Thermodynamic properties of the $SrO–BaO–Al_2O_3–SiO_2$ system were studied at 2000 K by high-temperature mass spectrometry. Ceramically prepared samples were XRD-characterized. Activities of BaO and SrO in the condensed phase were determined. Gibbs energy and excess Gibbs energy were calculated. The system exhibits negative deviations from ideal behavior. Data are significant for multicomponent oxide theory and Sr/Ba aluminosilicate applications.

DIRECT MEASUREMENTS OF THERMODYNAMIC STABILITY OF MELT-QUENCHED AND VAPOR-DEPOSITED 1,3,5-TRIS-(A-NAPHTHYL)BENZENE GLASSES

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A new approach to determining the thermodynamic stability of glasses using solution calorimetry is proposed. This method was applied to evaluate the thermodynamic stability of 1,3,5-tris(α-naphthyl)benzene glasses prepared by vapor deposition and melt quenching. As expected, vapor-deposited glasses exhibit higher thermodynamic stability compared to conventional ones, which is further supported by fictive temperatures obtained from DSC.

THE ROLE OF Al_2O_3 AND TiO_2 IN THE STRUCTURE FORMATION OF BORATE GLASSES WITH LOW MODIFIER CONTENT

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In this study, the structural evolution of low-modified alumino(titano)-borate glasses was characterized. It was shown that in the case of low concentrations of typical modifiers the decisive role in glass formation is played by superstructural units–stoichiometric analogs of compounds in the binary systems $Al_2O_3(TiO_2)–B_2O_3$. Vibrational spectroscopy analysis of the samples allowed for the numerical determination of the composition of superstructural units.

SYNTHESIS AND CHARACTERIZATION OF LITHIUM-BORATE-MOLYBDENUM GLASSES FOR NEW GENERATION SCINTILLATORS

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This study investigates modified glass compositions based on Li_2O-B_2O_3 with the addition of MoO_2, Al_2O_3, and SiO_2, activated by Tb^{3+} and Ce^{3+} ions to enhance light output. The optimal composition identified is $30Li_2O–60B_2O_3–10MoO_3$ with 5% Tb_4O_7 and 1% CeO_2, demonstrating excellent luminescent properties, high transparency, and thermal stability, thereby opening new opportunities for applications in medical diagnostics and security systems.

NEW CONSTRUCTION MATERIALS BASED ON NON-FERROUS METALLURGY WASTE

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In this paper, an approach to creating new materials based on non-ferrous metallurgy waste that has a negative impact on the environment and human life is considered. At the first stage of glass melting, incomplete fusion and uncontrolled crystallization were detected. At the second stage, abundant release of sulfur oxide was observed. As a result, the optimal composition of the glass of the $SiO_2–Fe_2O_3–Al_2O_3–CaO–MgO$ system was selected to solve these problems.

DESIGN OF OPTICAL CHALCOGENIDE GLASS-CERAMICS Ga–Ge–Se SYSTEM

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Work is devoted to the study of control of optical transparency by: changing phase and disperse structure of crystals, difference of refractive indices of crystalline phase and glass matrix in $Ga_{20}Ge_{20}Se_{60}$ glass-ceramics, doped with various additives.

These approaches allowed us to develop methods for obtaining chalcogenide glass ceramics with high optical transparency in the range of 2–16 μm.

RESEARCH OF MAGNITOOPTIC PROPERTIES OF $As_{40}X_{60}$ (X= S, Se, Te) GLASS SYSTEM

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Faraday isolators – optical components based on the effect of rotation of plane of polarization of eradiation. Dependence of magneto-optical properties and refractive index dispersion of $As_{40}X_{60}$ (X= S, Se, Te) glasses are considered in this work.

The samples show an increase of the Verde constant with increasing of tellurium content, for samples with high tellurium content value of the constant is comparable to values of classical materials for IR magneto-optics.

DATING OF GLASS ART ITEMS USING X-RAY FLUORESCENCE ANALYSIS AND MACHINE LEARNING METHODS

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Dating art glassware is essential for maintenance of museum collections. Non-destructive XRF analysis combined with machine learning enables accurate dating based on chemical composition. This study presents ML-based dating of 110 18th-century imperial tableware items. PLS-DA models, trained on preprocessed XRF spectra, achieved 84–94% accuracy. Ti, Fe, Rb, Sr content revealed key differences, reflecting technological improvements in glass production.

TECHNOLOGY FOR CREATING TRANSPARENT ELEMENTS BASED ON INDUSTRIAL GLASS CULLET FOR CREATING TIFFANY-STYLE LAMPS

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The aim was to develop a recycling technology for bottle glass cullet to produce environmentally friendly Tiffany-style lighting fixtures. Investigations were conducted to determine ratios of glass cullet, to establish appropriate thermal regimes to achieve optimal sintering conditions. As a result was received produce transparent samples with specified aesthetic qualities and Tiffany-style lamp.

CREATION OF A COMPLETE TECHNOLOGICAL CYCLE AND COMMERCIAL INTRODUCTION OF HIGH-PURITY QUARTZ GLASS PRODUCTION AT PJSC «PNPPK»

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A complete technological cycle for the production of high-purity quartz glass based on the sol-gel method has been developed. Serial production of high-purity quartz glass of the KS-1, KS-15, KS-1.1, KS-15.1 grades with a capacity of 2,500 kg/year has been launched. Unique methods for quality control of the initial components, quartz grit and quartz glass have been developed.

FABRICATION AND SOME OPTICAL PROPERTIES OF BISMUTH-DOPED SiO_2–GeO_2–B_2O_3 CORE GLASS OPTICAL FIBER GUIDES

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Results on development and investigations of bismuth-doped optical fiber codoped by GeO_2(23 mol.%) and B_2O_3(11 mol.%) is presented. It is revealed that in spite of high level of

B_2O_3 doping, bismuth active centers associated with Si (BAC-Si) remain dominant in glass. Also, we observed significant lifetime reduction of BAC-Si at levels 2 and 3 due to modification of phonon spectra in glass.

FIBERS WITH ULTRA-HIGH CONCENTRATION OF GERMANIUM AND BORON OXIDES FOR PRACTICAL APPLICATIONS

Burmistrov D.F. [1], Yashkov M.V.[1], Lipatov D.S.[1], Zaushitsyna T.S.[2], Tsvetkov S.V.[2], Iskhakova L.D.[2], Agakhanova V.A.[2], Likhachev M.E.[1,2]
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Results on development of optical fiber with core doped by germanium and boron oxides up to ultra-high content is presented. Up to 30 mol.% of B_2O_3 together with 12 mol.% of GeO_2 and 25 mol.% of B_2O_3 together with 21 mol.% of GeO_2 were incorporated into silica glass, while optical loss remains reasonably low (~ 20 dB/km near 1100 nm).

IMPROVEMENT OF ELECTRICAL DEVICES WITH METAL GLASS MAGNETIC CORES AS A TECHNOLOGICAL INNOVATION

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Electrical engineering is constantly evolving, and new materials are contributing to technological innovations, which in turn is solving many problems in this field. Such materials may include superconductors and hyperconductors, amorphous metals and new types of electrical insulation

The report discusses the application of amorphous alloys for the creation of electrical devices for renewable energy.

DETERMINATION OF THE POSITION OF LEAKAGE LEVELS IN LEAD-SILICATE GLASSES

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Research on disordered structures like lead-silicate glasses is increasingly relevant due to their electronic applications. Their electrical and optical properties exhibit blurred valence and conduction band levels. We identified a UV absorption edge in lead-silicate glass, suggesting a variable band gap width (Eg). The absorption edges in 6Ba4 and H230 glasses were analyzed using UV spectroscopy.

STUDY OF SPECTRAL LUMINESCENCE CHARACTERISTICS OF PHOSPHATE GLASSES CO-ACTIVATED BY Mn^{2+} IONS AND $CsPbI_3$ NANOCRYSTALS

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A series of phosphate glasses co-activated by Mn^{2+} ions and $CsPbBr_3$ nanocrystals have been synthesized. The spectral and luminescence characteristics of the synthesized glasses were investigated using time-resolved spectroscopy. The influence of the introduction of Mn^{2+} cations on the luminescence of perovskite nanocrystals was studied. The appearance of long-lived luminescence caused by energy transfer from Mn^{2+} ions to $CsPbI_3$ nanocrystals is shown.

GLASS-COMPOSITE ENCAPSULANT FOR AUTOMATED ASSEMBLY OF SPACE SILICON PHOTOVOLTAIC MODULES

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Glass composite encapsulation for silicon HJT photovoltaic converters intended for space solar modules was studied. Lamination parameters were optimized; outgassing, mass loss, thermal cycling resistance and radiation tolerance were analyzed. The effectiveness of glass composite in ensuring high reliability and manufacturability of solar modules for space applications was demonstrated.

THE STRUCTURE OF THE HIGH-BORON GLASSES OF THE $Na_2O–K_2O–B_2O_3–SiO_2$ SYSTEM

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The work is devoted to the study of the structure of borosilicate glasses by infrared spectroscopy and nuclear magnetic resonance methods, as well as the influence of the chemical composition of glasses on the coordination state of boron. It is indicated that there is a correlation between the ratio of groupings in the structure of the high-boron glasses of the $Na_2O–K_2O–B_2O_3–SiO_2$ system and the nature of the change in their properties.

COMPARATIVE EFFECT OF TiO_2, Ce_2O_3 AND Nb_2O_5 ON THE BIOACTIVITY OF GLASSES OF THE SYSTEM $Na_2O–CaO–MgO–SiO_2–P_2O_5$

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The results of studying the influence of titanium, niobium and cerium oxides on the bioactivity, structure and physicochemical properties of glasses of the

$Na_2O–CaO–MgO–SiO_2–P_2O_5$ system are presented. It has been established that the introduction of titanium and cerium oxides in the amount of up to 4 wt.% into the compositions of glasses of the $Na_2O–CaO–MgO–SiO_2–P_2O_5$ system is preferable.

VERY FINE QUARTZ GLASS IN THE TECHNOLOGY HCBS AND CERAMIC CASTABLES IN SYSTEMS: $Al_2O_3–SiO_2$; $Al_2O_3–SiO_2–SiC–C$

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Very fine quartz glass (VFQG)–effective component of highly concentrated ceramic binder suspensions (HCBS) used in technology for molded and unmolded ceramic castables technology. During object firing or high-temperature service for unmolded refractories on reaching 1200–1250 °C within the matrix system material based on HCBS containing VFQG there is a process of mullite formation.

HIGHLY CONCENTRATED CERAMIK BINDER SUSPENSIONS QUARTZ GLASS AND CASTING SYSTEMS BASED ON THEM

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Highly concentrated ceramic binder suspensions (HCBS) based on quartz glass used in the technology of centrifugally molded quartz glasses and tubes. The influence of the sintering process on porosity indices, density, bending and compressive strength was studied. The properties of nanoparticles were investigated and their effectiveness was determined in technology HCBS and casting systems based on them.

PREPARATION, MORPHOLOGY, STRUCTURE AND PROPERTIES OF FeO-DOPED LITHIUM GALLATE SILICATE GLASS-CERAMICS

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Transparent and opaque glass-ceramics were obtained by secondary heat-treatments of FeO-doped lithium gallate silicate glasses. Volume crystallization of γ-Ga_2O_3 and $LiGa_5O_8$ spinels and surface crystallization of $LiGaSi_2O_6$ were confirmed by XRD analysis and DSC study. SEM-EDX method revealed morphology of the materials. Absorption spectroscopy confirmed entering the Fe^{2+} ions into spinel crystallites. Monoclinic β-Ga_2O_3 crystallizes at 1100–1180 °C.

ANALYTICAL CONTROL OF RAW MATERIALS FOR GLASSES MODIFIED WITH HEAVY METAL FLUORIDES OF GROUPS I–IV

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A complex of solid-phase methods was used to characterize raw materials for heavy-metal fluoride glasses. Oxygen-containing and other impurities were identified, which may affect optical and luminescence properties. The results emphasize the need for control to ensure stable optical characteristics.

COATINGS BASED ON AN EPOXY MATRIX WITH ADDITIVES OF MODIFIED SILICON DIOXIDE NANOPARTICLES

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This study investigates hydrophobic epoxy coatings with SiO_2 nanoparticles modified by vinyltriethoxysilane (VTEOS) and bis[3-(trimethoxysilyl)propyl]amine (BTMSPA). Coatings showed increased water contact angles, the highest value was achieved in the case of a coating with SiO_2-BTMSPA (97°), and mechanical properties. Coatings containing SiO_2-VTEOS nanoparticles demonstrated better durability against atmospheric corrosion in tropical conditions.

GLASS FILLERS FOR DENTAL MATERIALS

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In this work in the system SiO_2–BaO–Al_2O_3–B_2O_3–SrO was obtained glass powder with increased strength and adhesion properties to organic matrix, which can be used as filler of filling materials. In the system SiO_2–Al_2O_3–P_2O_5–SrO–AlF_3 has been developed a glass, mixing the powder of which with various mixing liquids allows obtaining glass ionomer cements characterized by satisfactory values of compressive strength.

INFLUENCE OF THE SURFACE MIXED OXIDE COMPOSITION ON THE OPTICAL PROPERTIES OF GLASS WITH ITO COATING

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This study explores the effect of $AlCr_xO_y$ and $TiCr_xO_y$ nanolaminates deposited via molecular layering on the optical properties of ITO-glass. By adjusting the subcycle ratios of Al_2O_3, TiO_2, and CrO_x precursors (1:1 and 1:5), films with selective transmission and absorption were obtained. The results show that multilayer oxide architecture enables tuning of spectral behavior for advanced optical applications.

NEW BISMUTH-SILVER-CONTAINING PHOTOLUMINOPHORES, COACTIVATED WITH Sm^{3+}, BASED ON POROUS GLASSES: SYNTHESIS AND SPECTRAL PROPERTIES

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Bismuth-silver-containing composites were synthesized in the presence or without Sm^{3+} by an impregnation of the silica porous glasses with acidified water-salt solutions of salt nitrates. Composites were studied by UV-VIS-NIR and luminescence spectroscopy. The influence of the composition (the concentration and mass ratio of salts in the solutions) and the heat treatment mode of composites on their spectral and luminescent properties have been established.

STUDY OF THE DEGRADATION MECHANISM OF BOROSILICATE GLASS CONTAINING CESIUM AND STRONTIUM OXIDES (10 MASS. %), BY PROLONGED LEACHING

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The kinetics and mechanism degradation of borosilicate glass with a content of cesium and strontium oxide 10 wt. % have been studied at 25 °C by aged in distilled water for 1 year. It was found that during the leaching of strontium glass, a large number of secondary phases are formed. The surface layer of cesium glass hadn't practically secondary phases.

"BELOZERKA GLASS" OF THE NORTHERN BLACK SEA REGION: INNOVATION AND ITS DISAPPEARANCE AT THE END OF THE BRONZE AGE

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The glass beads were found in the elite burials of the Late Bronze Age Belozerka culture (11th–10th cc. BC). The chemical composition is presented by mixed-alkali glass unlike from Italian adornments. These data allowed suggesting about the local glass manufacture of "Belozerka glass workshop" in the Northern Black Sea region at the end of the Bronze Age. The glass necklaces were made just for individuals of high social status.

SYNTHESIS, PHASE SEPARATION, AND PHYSICO-CHEMICAL PROPERTIES OF SODIUM BOROSILICATE GLASSES DOPED WITH MANGANESE OXIDES

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Here we report the results on studying the glasses of the $Na_2O–B_2O_3–SiO_2$ system doped with Mn_2O_3 (mol %: 70% SiO_2, 2–12% Na_2O, 10–22% B_2O_3, 0.3–10% Mn_2O_3). Methods such

as XRD, SEM, and IR spectroscopy were used and the density of the glasses was measured. Structural changes depending on the composition of the glasses were revealed. The prospects of glasses for obtaining porous glasses are demonstrated.

ATOMISTIC CALCULATION OF THE STRUCTURE AND DYNAMICS OF ATOMS IN BASALT-BASED GLASSES

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The paper presents atomistic modeling of silicate glasses of complex composition using the atomic dynamics in the LAMMPS software package, which includes the construction of RDF, and the study of the diffusion dynamics of atoms in silicate glasses with compositions corresponding to basalt-based glasses. It is shown that the movement of low-charge (Na^+, Mg^{2+}, K^+, Ca^{2+}, Fe^{2+}, O^{2-}) ions occurs almost freely, taking into account the viscous resistance of the medium.

DEPENDENCE OF THE PROPERTIES OF BOROSILICATE GLASSES OF THE B_2O_3–Al_2O_3–Me_2O/MeF (Me = Li, Na, K) SYSTEMS ON THE CONTENT OF ALKALI METAL OXYFLUORIDES

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The glass-forming regions, physicochemical, and optical properties of B_2O_3–Al_2O_3–Me_2O/MeF systems (Me = Li, Na, K) were studied depending on the ratio of alkali metal oxides and fluorides. The influence of metal ionic radii and partial substitution of oxygen with fluorine on glass formation, crystallization, and glass properties was revealed. Optical glasses of a new composition with a low refractive index and a high dispersion value have been developed.

SYNTHESIS AND PROPERTIES OF GLASSES WITH PEROVSKITE NANOCRYSTALS $CsPbX_3$ (X=Cl, Br, I)

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The growth features of $CsPbX_3$ (X=Cl, Br, I) NCs in borate and fluorophosphate matrix are considered. The features of anionic (Cl→Br) and cationic (Pb→Cd) substitution in NCs are shown to change the luminescence wavelength. The possibility of NCs formation in borate glasses in Br–I and Cl–Br systems is shown. The spectral-luminescence characteristics of $CsPbX_3$ nanocrystals (X=Cl, Br, I) in borate and fluorophosphate glasses have been compared.

TEMPERATURE COEFFICIENT OF LINEAR EXPANSION OF DINAS, QUARTZ GLASS AND QUARTZ CERAMICS

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The temperature coefficient of linear expansion (TCLE) was measured using a DIL 402C dilatometer. TCLE is necessary, among other things, to evaluate one of the most important thermophysical properties of refractory products – heat resistance – the ability of materials to withstand stresses caused by temperature changes. Dinas, quartz glass and quartz ceramics produced by JSC «DINUR» were chosen as the objects of research.

HEAT RESISTANCE OF SELF-GLAZING COMPOSITIONS AND GRAPHITE COATINGS BASED ON TiB_2–Si_3N_4

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It is shown that in the TiB_2–Si_3N_4 system, glass-ceramic compositions are formed during heat treatment in air, which can be used as protective coatings on graphite. During chemical reactions, a titanium borosilicate glass-forming melt is formed, encapsulating the initial powder particles. The influence of the heat treatment regime on the formation of coatings has been studied. Silicon nitride has been shown to improve the heat resistance of the coating.

SODIUM BOROSILICATE GLASSES DOPED WITH TRANSITION METAL OXIDES

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Transition metal ions (TMI) exist in glass in more than one valence and coordination state, which determines the unique physical properties of doped glasses and, in turn, determines a wide range of their practical applications. This study focuses on the influence of doping the sodium borosilicate glasses with TMI in the range of compositions prone to phase-separation, on their structure, crystallization, phase separation and physicochemical properties.

INFLUENCE OF MICROINCLUSIONS ON THE QUALITY OF QUARTZ GLASS

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The study aims to investigate the effect of microinclusions in natural quartz on the quality of the resulting glass. Key factors that determine the quality of glass have been identified, such as the presence and location of microinclusions in the original natural quartz, the fractional composition of the glass, and the conditions of the fusion process.

ARTISTIC GLASS PRODUCTION IN RUSSIA: SCIENTIFIC AND INDUSTRIAL CHALLENGES AND SOLUTIONS

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Nowadays there is a tendency of clear and coloured glass cullet melting of Russian and foreign compositions which do not always correspond to characteristics requirements. The problem of provision of creative workshops with equipment and glass with set characteristics is a complex objective of the glass industry with active support of the government.

THE TECHNOLOGY OF MANUFACTURING PRODUCTS OF COMPLEX SHAPE BY VACUUM MOLLING FROM FLAT GLASS

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The dependences in the temperature-strain-viscosity system for flat glass in the range of $9>\lg(\eta)>5$ have been investigated and established. A method has been developed for determining the viscosity of glass based on an existing analogue for sheet glass, which allows adjusting the molling temperature without conducting a large number of laboratory tests. The functional dependences of the discharge in the mold and the temperature during molling are obtained.

OPTICAL PROPERTIES OF GLASS-LIKE CHALCOGENIDE SEMICONDUCTORS GeAsSeSnSbTe IN THE TERAHERTZ SPECTRUM RANGE

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Using terahertz (THz) spectroscopy, the optical properties of $Ge_xAs_ySe_{1-x-y-z-s-t}Sn_zSb_sTe_t$ chalcogenide glasses were studied in the 0.1–2.5 THz range. Spectra revealed a broad absorption band at 0.9–1.5 THz, depending on the composition, identified as a “boson peak” (BP). Debye frequencies for the set of studied glasses were calculated and showed a certain correlation with the BP frequencies observed in the investigated materials.

OPTIMIZATION OF TECHNOLOGY FOR THE PRODUCTION OF THIN VITREOUS ELECTRICALLY CONDUCTIVE SnO_2 FILMS DOPED WITH FLUORINE FOR USE IN OPTOELECTRONICS AND MICROELECTRONICS

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Fluorine-doped SnO_2 thin films were synthesized via sol-gel using different alcohols and fluorine concentrations. The films were characterized by UV spectroscopy, microscopy, and

four-point probe measurements. Isopropyl alcohol-based films with high fluorine content showed the best transparency (77%) and lowest resistivity (3×10^9 Ω/sq), making them suitable for advanced optoelectronic devices.

CALCULATION OF TEMPERATURE IN THE REGION OF INTERACTION OF FEMTOSECOND LASER RADIATION WITH FLUOROPHOSPHATE GLASS CONTAINING PEROVSKITE PRECURSORS

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The work studies the effect of ultrashort femtosecond laser pulses on the optical properties of fluorophosphate glasses containing Cs^+, Pb^{2+} and Br^- ions. To analyze the thermodynamic parameters of the crystal formation process, the temperature distribution was simulated using a heat source model. An experimental method for estimating the temperature in the region of interaction of laser radiation with glass is proposed.

3D-PRINTING IN SOLID OXIDE FUEL CELL TECHNOLOGY

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This report reviews additive technologies used in solid oxide fuel cell development focusing on the prospects for the application of fused deposition modelling to produce glass-polymer composites for sealing tubular SOFCs. Besides, some approaches to the formation of fuel cells such as selective laser melting and stereolithography will be discussed.

REFINED QUARTZ RAW MATERIAL FOR GLASS INDUSTRY

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Research has been conducted to reduce clayey impurities and iron compounds in the composition of quartz glass sand. The method includes activating quartz sand grains with a small amount of sodium hydroxide (1–5 wt.%) followed by washing off water-soluble compounds from the surface of the quartz grains.

CHEMICAL DURABILITY OF GLASSES OF THE $Na_2O–K_2O–B_2O_3–SiO_2$ SYSTEM

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The chemical durability of the phase-separated glasses with compositions $6(Na,K)_2O·34B_2O_3·60SiO_2$ in 3M solution HCl was studied. The percentage of extraction and effective diffusion coefficients of components of unstable phase were determined. The

introduction of K_2O reduces the rate of Na_2O extraction up to an equal content of alkaline oxides, thus raising the acid stability of materials. The optimal composition is proposed for making porous matrices.

LASER-INDUCED BREAKDOWN SPECTROSCOPY METHOD FOR MONITORING MICROINHOMOGENEITIES IN HEAVY GLASSES FOR NONLINEAR OPTICAL APPLICATIONS

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The distribution maps of lead on the surface of lead-silicate and lead-germanate glass blanks were obtained. The relationship between various elements in the glass blank and the concentration of PbO, GeO_2, SiO_2 in the samples was established. The parameters of laser radiation exposure on the sample surfaces were optimized (pulse energy, frequency, wavelength, signal registration delay).

DEVELOPMENT OF ACTIVE OPTICAL FIBERS WITH A MULTI-COMPONENT SILICATE CORE FOR NARROW-BAND LASERS

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The MCVD technology for manufacturing of optical fibers with a silicate core doped with Er_2O_3, Yb_2O_3, Bi_2O_3, Al_2O_3, P_2O_5, GeO_2 in various combinations has been developed. Photosensitive Er-, Yb-, Er-Yb- and Bi-doped fibers have been manufactured for obtaining two types of single-frequency lasers: with a short and with a long resonator. Optical fiber lasers emitting a reference signal at wavelengths of 976, 1590 and 1670 nm have been implemented for the first time.

OBTAIN AND STUDY OF OPTICAL FIBER WITH A CORE FROM ALUMINOPHOSPHOROSILICATE GLASS DOPED WITH Nd AND Bi

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Optical fibers with a core of Al_2O_3–P_2O_5–SiO_2 glass doped with Nd_2O_3 was manufactured. It was found that to achieve a pump-to-signal conversion efficiency of more than 40 %, the neodymium ion concentration must not exceed 0.02 mol.%.

Bismuth-doped fibers with a core glass content of $AlPO_4$ groups in the range of 5–23 mol.% were obtained. The luminescent properties of active centers and their radial distribution in the samples of the obtained preforms were studied.

STRUCTURE AND PROPERTIES OF BOROSILICATE GLASS WITH MODEL PHOSPHATE-CONTAINING RADIOACTIVE WASTES

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The results of experiments on the synthesis of borosilicate glass for the immobilization of phosphate-containing radioactive waste are presented. The inclusion of radioactive waste was 10, 15 and 20 wt. %. The structure and properties of glasses were studied; quartz and silica sol were used as SiO_2 precursors. It is determined that glass with inclusions of radioactive waste up to 15 wt. % are amorphous, homogeneous and have high water resistance.

STUDY OF BIOACTIVE PROPERTIES OF CESIUM-CONTAINING QUARTZOID GLASS

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The bioactivity of high-silica quartzoid glasses (QG) containing cesium was studied on test objects: *Staphylococcus bacteria*, *Escherichia coli* and yeast of the genus *Candida auris*, and soil bacteria. The relevance of the study is related to the assessment of possible consequences for the environment. The bioactivity of QG is associated with the release of Cs and Na ions into the environment.

AGING OF GLASSES OF THE SYSTEM $Na_2O–BaO–B_2O_3$ ACCORDING TO DTA DATA

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Two groups of $Na_2O–BaO–B_2O_3$ glasses with compositions lying on the diborate section were studied. The glasses were synthesized using the same method, but with a time difference of about 25 years. Numerical data for special points of the DTA curves correctly lay on the solidus lines and the dependence of Tg on the composition. However, there is a region of compositions where the crystallization coefficient of old glasses is significantly lower than that of new ones.

TECHNOLOGY FOR PRODUCING NEW GLASS MATERIALS WITH ANTIBACTERIAL NANOCOATING FOR USE IN WATER PURIFICATION SYSTEMS FROM MICROBIOLOGICAL POLLUTANTS

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The study proposes to obtain antibacterial nanocoatings on the surface of glass beads used as cartridges in water purification systems for removing microbiological contaminants

using the molecular layering method. The antibacterial nanocoating obtained on glass filters helps to reduce microbial contamination and effectively eliminates organic impurities in water.

ON THE QUESTION OF THE OPTICAL BASICITY EFFECT ON THE OPTICAL PROPERTIES OF Eu-DOPED BOROSILICATE GLASS

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The relationship of the properties of Eu-doped aluminoborosilicate (ABS) and optical basicity was studied. It's found that the optical basicity value does not exceed the known critical meaning and has a lower value. The increase in the Eu_2O_2 concentration results in the slight optical basicity growth. At the same time, the more Eu^{3+} ions are placed in the glass, the more Eu^{2+} ions are. A possible mechanism for the reduction of europium ions in ABS glass is discussed.

STUDY OF GLASS FORMATION, CRYSTALLIZATION FEATURES AND PROPERTIES OF GLASSES OF THE SYSTEM SiO_2–B_2O_3–MeO/MeF_2 (Me = Zn, Cd)

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The glass-forming regions in the SiO_2–B_2O_3–MeO/MeF_2 (Me = Zn, Cd) system and the physicochemical properties of glasses in binary and ternary compositions were investigated to develop low-melting glasses and glass-ceramic materials. Coordination transformations in the glass structure, crystalline phases formed during crystallization, and the role of fluorides in glass formation and properties were studied.

EFFECT OF NIOBIUM (V) OXIDE ON MIGRATION CHARACTERISTICS OF ALKALI IONS IN OXIDE GLASSES

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The influence of Nb_2O_5 on the structure of alkali phosphate and silicate glasses is considered. In phosphate glasses, Nb_2O_5 doesn't form common structural units with alkali ions; migration processes are determined solely by the phosphate component. In silicate glasses, both alkali and niobate structural units affect migration. In both systems, when one alkali cation is replaced by another, a polyalkali effect is observed.

PHYSICO-CHEMICAL CHARACTERISTICS OF CERAMIC MATERIALS IN THE $BaO–SrO–Al_2O_3–SiO_2$ SYSTEM

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This study examines $Sr_xBa_{1-x}Al_2Si_2O_8$ (x=0.1–0.9) ceramics synthesized at 1350°C (5–10 h) for radiotransparent applications. XRD revealed single-phase hexagonal structures with Vegard's law compliance. Extended annealing (10 h) improved density (3.21 g/cm^3), reduced porosity (17–32 %), and maintained stable Young's modulus (46–70 kPa), demonstrating optimal performance for thermal barrier coatings in aerospace applications.

CRYSTALLIZATION OF QUARTZ GLASS

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The report presents the results of the study of quartz glass crystallization obtained on the basis of natural quartz of different genesis. It is shown that the temperature of the onset and kinetics of quartz glass crystallization depend not only on the purity of quartz concentrates from which the quartz glass is fused, but are also determined by the genesis of the quartz.

FABRICATION OF BISMUTH-DOPED FIBER PREFORMS BASED ON MULTI-COMPONENT CORE GLASS COMPOSITION $SiO_2–Al_2O_3–P_2O_5–GeO_2$

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Preforms from multicomponent glass with a multilayer core composition of $SiO_2–Al_2O_3–P_2O_5–GeO_2$, were manufactured using the all-gas-phase MCVD technology. The core layers of aluminosilicate, phosphorus silicate and germanium silicate glass were doped with bismuth and physically separated from each other. This structure of the glass core will allow for the controlled creation of bismuth active centers (BAC) of the required type.

BISMUTH-DOPED FIBERS WITH COMPLEX DOPING PROFILE FOR NEAR-IR LASERS AND AMPLIFIERS

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A series of bismuth-doped optical fibers (BDFs) fabricated using all-gas-phase MCVD method, which becomes a basis for development of watt-level lasers and broadband amplifiers

for telecommunication spectral regions (O+E+S wavelength range), where multimode laser diodes serve as a pumping source. The significance of the research consists in the practical implementation of BDFs of new lightguiding structures obtaining active devices with improved parameters.

FOAM GLASS: THE DIFFICULT PATH TO MASS PRODUCTION

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Foam glass is the most durable thermal insulator, but it occupies a limited niche in the market. Changes in the regulatory framework and technical policy of the Ministry of Construction indicate that the production of foam glass is expected to grow rapidly. Now the production of bulk (granulated) foam materials is leading, which can replace slab foam glass in 60–70 % of applications. A key turn in the growth will be production of foam glass based light concrete wall panels.

SEMI-QUANTITATIVE ANALYSIS OF THE RAMAN SPECTRA OF $Na_2O–B_2O_3–SiO_2$ GLASSES WITH $R = 1$

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The structure of $Na_2O–B_2O_3–SiO_2$ glasses with $R \approx 1$ was studied by Raman spectroscopy. The changes in the fraction of different type of structural groups were illustrated by composition dependences of relative integrated intensities of the Raman bands corresponding to the vibrations of these structural groups. The results of semi-quantitative analysis of measured Raman spectra were compared with the data of the theoretical predictions (Dell's model and TD model).

THE CURRENT STATUS OF THE GLASS INDUSTRY. REAL WAYS TO EFFICIENT PRODUCTION

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This report examines the current state of the glass industry and identifies realistic ways to improve its efficiency. Key market trends are examined and significant technological advances are highlighted.

Particular attention is paid to environmental aspects and energy efficiency of glass production.

Recommendations for the development and improvement of the competitiveness of the domestic glass industry have been formulated.

ON THE QUESTION OF ATTRIBUTION OF RUSSIAN ART GLASS OF THE FIRST HALF OF THE XVIII CENTURY: AN INTEGRATED APPROACH USING TECHNICAL ANALYSIS METHODS (USING THE EXAMPLE OF WORKS FROM THE COLLECTION OF THE STATE HERMITAGE MUSEUM).

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The report is devoted to the attribution of Russian art glass of the first half of the XVIII century. Based on the material of works from the collection of the State Hermitage Museum, their origin and technology are clarified using art historical analysis and scientific and technical expertise. Samples of potassium glass of the German-Bohemian type and lead crystal glass made according to the English recipe were revealed.

PHASE EQUILIBRIUMS AND PHASE TRANSFORMATIONS IN THE GLASS FORMATION REGION OF THE $Na_2O–BaO–B_2O_3$ SYSTEM

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We studied the crystallization of glasses of the $Na_2O–BaO–B_2O_3$ system with B_2O_3 content of more than 50 mol. % and their thermal transformations up to melting using the DTA and X-ray diffraction methods. Based on the results of the study, a phase diagram for the studied part of the system was constructed for the first time: triangulation was performed, liquidus isotherms were plotted, and the fields of primary crystallization of compounds were determined.

OXIDE GLASSES WITH ANIONIC CONDUCTIVITY. METHOD OF DETERMINING TRANSFER NUMBERS

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This paper proposes a modified gravimetric Tubandt method for determining the transport numbers of halogen ions for glasses with unipolar anionic conductivity.

The transport numbers of halogen ions are determined from the ratio of the number of current carriers released when a known amount of electricity is passed through a solid electrolyte and the number of carriers calculated theoretically according to Faraday's law.

CATIONIC CONDUCTIVITY OF GLASSY SOLID ELECTROLYTES. DETERMINATION OF TRANSFER NUMBERS

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The work is devoted to the method of determining the transfer numbers by means of the Tubandt method in crystalline and glassy solid electrolytes with high cationic conductivity using $AgAsS_2$ as an example. In this case, noticeable migration of associates is unlikely, and unidirectional transfer of charge and mass occurs, which allows obtaining "true" transfer numbers.

STUDY OF THE POSSIBILITY OF SYNTHESIZING GLASS BASED ON NATURAL RAW MATERIALS SOURCED FROM THE SVERDLOVSK REGION FOR HEAT– AND SOUND–INSULATING MATERIAL PRODUCTION

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Article describes the process of synthesizing glass on basis of low–cost locally sourced natural materials and cullet. Absence of expensive high–grade quartz sand reduces cost of production. Properties of synthesized glass allow it to be used for mineral wool and glass microsphere production.

INVESTIGATION OF THE PROPERTIES OF GLASS SOLDER FOR ALUMONITRIDE CERAMICS AND SOLDER BASED ON IT

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This work describes the development of glass solder compositions for joining ceramic parts based on aluminum nitride. The paper presents the main properties of the three compositions, determines the temperature dependence of the wetting angle of alumonitride ceramic melt on temperature, and describes the resulting ceramic compound using glass solder.

STUDY OF EVAPORATION PROCESSES AND THERMODYNAMIC PROPERTIES OF CAESIUM TITANATES

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This work focuses on thermodynamic properties of $Cs_2Ti_6O_{13}$, a potential matrix for radioactive waste immobilization. Vaporization and thermodynamic properties were studied by high-temperature mass spectrometry. The partial pressure of Cesium was measured, and the enthalpy of the evaporation reaction was determined. The next step in research is to study the effect of substituents on thermodynamic properties.

CORE-FORMED GLASS VESSELS FROM THE STATE HISTORICAL MUSEUM: NEW INSIGHTS ON THE ORIGIN AND MANUFACTURING TRADITIONS

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The chemical composition of glass of nearly 40 core-formed vessels from the collection of the State Historical Museum (Moscow) has been studied using SEM-EDS and LA-ICP-MS techniques. The findings of the late 6^{th}–1^{st} centuries BC originated essentially from the North Pontic region could have been imported here from Rhodes, mainland Greece, Italy, Cyprus, and some other regions. The origin of glass and the glassworking practices will be discussed in the paper.

THE PHASE SEPARATION IN K_2O–PbO–CaO–P_2O_5–SiO_2 GLASS DOPED BY GOLD

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In this work, the effect of gold on the phase separation in K_2O–PbO–CaO–P_2O_5–SiO_2 glass was investigated. It has been established that phase separation proceeds the formation of gold nanoparticles that are formed inside droplets of the phosphate phase during annealing. This makes it possible to modify the optical properties and microstructure of the commercial lead glass.

COMPOSITIONS OF GLASSES PRODUCED AT THE NAZI GLASS FACTORIES IN THE 1750S AND 1780S

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The analyses of glasses found at the site of the Naziya glass factories in 1750–1780 are reported. Based on their chemical composition, the glass is divided into nine group. Besides the ash glass of various types, these factories produced potash, potash-lime, potash-lead and high-lead crystal glass of various colors.

THE INFLUENCE OF ELECTROMAGNETIC FIELDS ON THE STRUCTURE AND PHYSICO-CHEMICAL PROPERTIES OF INDUSTRIAL GLASSWARE

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The influence of constant, alternating and impulse magnetic fields on the physico-chemical properties of industrial glassware of different purpose has been investigated. The electromagnetic treatment increases the mechanical strength of glassware from 25 to 30 %, at the same time the microhardness increases from 10 to 20 %, thermal resistance – from 5 to 10 %.

COOPERATION OF GLASS PHASE IN MULLITE MATRIX SYNTHESISED UNDER THE ACTION OF ARC DISCHARGE PLASMA

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In this paper, the cooperation of the glass phase in the mullite matrix synthesized under the action of arc discharge plasma is investigated. Based on the data obtained, conclusions were made about the distribution of the Si and Al elements in the polished section of the melting product. Silicon is distributed mainly in the form of narrow and long fibers, which indicates the presence of an oriented glass phase in the mullite matrix.

HISTORY, CURRENT STATE AND PROSPECTS OF APPLICATION OF THIN GLASSY 'SPIN-ON GLASS' FILMS

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'Spin-on glass' films are a traditional product of sol-gel technology. Pioneering work on the use of these films in microelectronics was carried out at the Institute of Silicate Chemistry in the 20th century. Now more attention is being paid to thin films for flexible microelectronics, photonics and solar energy. The report will consider modern trends in sol-gel technology thin glassy films and controlling their properties.

OBTAINING A POROSITY-FREE LAYER ON THE SURFACE OF NANOPOROUS GLASS BY MEANS OF LASER HEAT SEALING

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The dependence of the thickness of the thermally sealed layer on the number of repeats of CO_2-laser scanning of the same surface of nanoporous glass was investigated. Successful formation of a heat-sealed layer with a thickness of 59 ± 3 μm at ten times repetition of scanning was demonstrated. The possibility of recording polarisation-controlled birefringent structures with femtosecond pulses in and under a thermally compacted glass layer has been studied.

TEMPERATURE STABILITY OF HEAVY ION TRACKS IN GLASSES AND MINERALS

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In experiments on the synthesis of superheavy elements, the temperature at the stage of registration of decay products can reach 500°C. In these conditions, the electronic detectors are

not applicable, and only detectors of dielectric materials can be used. A number of natural and synthetic materials have been tested in the search for dielectrics capable of preserving ion tracks at high temperatures with minimal distortion. The research results are presented.

GLASS-CERAMICS BASED ON THE Cs_2O-SrO-Al_2O_3-SiO_2 SYSTEM: HIGH-TEMPERATURE MASS SPECTROMETRIC STUDY AND MODELING OF THE THERMODYNAMIC PROPERTIES

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Cs_2O–SrO–Al_2O_3–SiO_2 glass-ceramics was studied via XRD, SEM/EPMA, DSC/TG, XRF, and Knudsen effusion mass spectrometry (KEMS). Cs and O_2 were main vapor species to 1473 K. Cs partial pressures, Cs_2O activities, and partial molar thermodynamic properties were first obtained by KEMS, showing negative deviations from ideality. The Kohler method and generalized lattice theory of associated solutions were used to calculate Cs_2O activities based on the binary data.

ADDITIVE MANUFACTURING USING CORE-SHELL POWDERS

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The use of 3D printing for the manufacture of ceramic products has a number of difficulties and limitations. Printing with ceramics using SLS technology is problematic due to insufficient laser energy.

The authors propose using a "core-shell" approach to improve SLS additive technologies. A "ceramic core-metal shell" powder technology has been developed for the process.

50TH ANNIVERSARY OF THE JOURNAL "PHYSICS AND CHEMISTRY OF GLASS". A RETROSPECTIVE AND A LOOK INTO THE FUTURE

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The journal Physics and Chemistry of Glass was founded in 1975 to publish papers related to fundamental research in the field of physics and chemistry of glass. Since 2000, the magazine's subject matter has expanded significantly. The analysis of the journal's thematic headings in a historical context and their classification is the main task of the presented report.

TeO_2–WO_3–$Na_6P_6O_{18}$ GLASS-FORMING SYSTEM

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The glass-forming region of TeO_2–WO_3–$Na_6P_6O_{18}$ system was determined, the nature of the crystalline phases was established. The thermal behavior of glasses in the range of 25–400 °C was examined, the characteristics of devitrification and the glassy state were ascertained. The optical characteristics of glasses in the UV, visible, and IR spectral ranges were studied. A comparative analysis was conducted with the properties of the binary system TeO_2–WO_3.

MODEL OF AN ELECTRIC MACHINE WITH METAL TAPE GLASS MAGNETIC CORE

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The purpose of this work is to develop a generator for an autonomous electromechanical system that will use freon energy to generate electricity for auxiliary consumers.

The developed synchronous generator is based on permanent rare-earth magnets and an amorphous alloy magnetic core. The generator's design is compact and technologically advanced, which simplifies its manufacturing process and reduces production costs.

3D-PRINTED GLASS SEALANTS FOR SOLID OXIDE FUEL CELLS SEALING

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Sealing is the crucial step in solid oxide fuel cell assembly. This study reveals the potential of material extrusion for the production of complex shape objects for sealing of tubular SOFC. The composition based on polymer binder and a filler (aluminosilicate glass sealant) was tested. The highest filler content in the mixture is 72 % wt (47 % vol). The printed parts were successfully applied to seal a tubular bearing anode and steel interconnect.

STUDY OF NANOPARTICLE FORMATION IN OXYFLUORIDE GLASSES

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Samples of glass ceramics were obtained by heat-treating oxyfluoride glasses. The secondary heat treatment regime of the glass on the structural features of PbF_2 nanoparticles were studied using small-angle X-ray scattering and X-ray diffraction methods. The enlargements of the average sizes of nanoparticles and the sizes of local areas of density fluctuations have been found.

EFFECT OF HIGH PRESSURE ON THE PROPERTIES AND STRUCTURE OF GeS_2 AND As_3Te_2 GLASSES

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The report examines the effect of pressure up to 8 GPa on the properties and structure of chalcogenide glasses using the example of GeS_2 and As_3Te_2 glasses. The results of a study of the relaxation process of changes that occurred in glasses due to pressure are presented. The data obtained indicate a fundamental change in the properties of glasses after the pressure is removed and the stability of this state. Aspects of the practical application of the effect are considered.

INFLUENCE OF METALPHILIC INTERACTIONS ON THE PROPERTIES OF CHALCOGENIDE GLASSES

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It is noted that the formation of metallophilic bonds in the glass network, in addition to covalent ones, leads to an increase in the glass transition temperature and plasticity. In particular, we are talking about metallophilic silver-silver bonds. This opens up the possibility of obtaining inorganic glass capable of relaxing mechanical stresses at room temperature.

DIFFERENCE IN PHASE FORMATION PATHWAYS DURING SOLID-STATE SYNTHESIS AND GLASS CRYSTALLIZATION IN THE $SrO{\cdot}SiO_2 – SrO{\cdot}B_2O_3$ SYSTEM

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Phase formation in the $SrO{\cdot}SiO_2 – SrO{\cdot}B_2O_3$ system was studied. Crystallization of glasses (845 °C) results in equilibrium decomposition into $SrO{\cdot}SiO_2$ (SrSi) and $SrO{\cdot}B_2O_3$ (SrB), confirming a pseudo-binary eutectic section. Solid-state synthesis (900 °C, up to 16 days) forms non-equilibrium intermediate phases (ortho-/pyroborates, orthosilicate) without achieving the SrSi+SrB composition. The equilibrium state is realized only via the glass-forming melt.

STUDY OF PHASE FORMATION PROCESSES IN A SODIUM SILICATE SYSTEM WITH A HIGH CONTENT OF SILICON DIOXIDE

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Phase equilibrium in the $Na_2O–SiO_2$ system (0.39–2.91 mol.% Na_2O) at 1400 °C was investigated. It was demonstrated that thermal treatment of natural high-purity quartz with a

mineralizer (Na_2CO_3) result in cristobalite (C) formation, which partially or completely transforms into tridymite (T). Increasing Na_2O content and isothermal holding time accelerates this transformation. The C + T region was confirmed, and no direct quartz→T transition was established.

THE EFFECT OF FLiNaK ADDITIVE ON THE THERMOPHYSICAL PROPERTIES OF PHOSPHATE GLASSES

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Operation of molten salt reactors using FLiNaK salt as a coolant is accompanied by the formation of corresponding radioactive waste. Phosphate glasses are considered as matrix for vitrification and further safe storage of this type of waste. In this work effect of FLiNaK additive on thermophysical properties of phosphate glasses, particularly glass transition temperature, thermal stability and crystallization features is studied.

BORON ANOMALY: A REVISION OF THE KNOWN CONCEPT

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It is shown that, currently, the concept of boron anomaly developed in the 1960s has a historical rather than fundamental significance. This is confirmed by examples of mistakes in establishing the structure-property relationships on the basis of information on the content of boron-oxygen tetrahedra in glasses, whereas the presence of triangles and metal-oxygen polyhedra is neglected. The examples are taken from high rating journals.

THERMOCHEMICAL HARDENING OF ALUMOSILICATE SYSTEM GLASSES FOR APPLICATIONS IN STRUCTURAL OPTICS PRODUCTS

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Structural optical components (SOCs) are widely employed in aerospace due to their mechanical strength and optical transparency. Aluminosilicate ($Na_2O–Al_2O_3–SiO_2$) glasses were studied as SOC materials for their suitability for ion exchange. The optimal regime was 450°C for 48 hours, increasing Vickers hardness from 5.75 GPa to 8.05 GPa. Optical transmission decreased only by 0.57 %, confirming the material's potential for demanding conditions.

EFFECT OF ALKALI METALS FLUORIDE MIXTURE (FLiNaK) ADDITION ON THE PROPERTIES OF PHOSPHATE GLASSES

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The work presents results of comprehensive study of the LiF–NaF–KF eutectic mixture (FLiNaK) effect on the properties of phosphate-based glasses. The FLiNaK solubility in the glass matrix, changes in local structure, chemical and mechanical stability and thermo-physical properties of the glasses were evaluated. It was shown that F anions preferentially incorporate into Al coordination sphere and attracts Na ions. Interrelation between properties is discussed.

ELECTRICAL CONDUCTIVITY OF PHOSPHATE GLASSES WITH ADDITION OF ALKALI METALS FLUORIDE MIXTURE IN THE WIDE TEMPERATURE RANGE

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Phosphate-based glasses are prospective materials for vitrification of halide radioactive wastes (RAW), and eutectic mixture of LiF–NaF–KF (FLiNaK) is one of such RAW. In this work electrical conductivity of phosphate glasses was studied in a wide temperature range covering glass transition region. Effect of FLiNaK addition as well as of glass matrix composition on electrical properties was evaluated.

INVESTIGATION OF THE CHARACTERISTICS OF ALUMINOPHOSPHATE GLASSES WITH INCLUSION OF SIMULATED PERLITECONTAINING RW

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The paper describes a laboratory vitrification of the perlitecontaining sludge which simulated high-level suspensions accumulated at the Mayak PA. The results of the study of homogeneity, chemical resistance and durability of aluminophosphate glasses with varying degrees of inclusion sludge are presented. Compliance of the specimens with the regulatory requirements for glasses in terms of homogeneity, chemical stability and durability was evaluated.

VITRIFICATION OF HIGHLY RADIOACTIVE PERLITE-CONTAINING PULP

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Glass-containing matrix materials synthesized from aluminoborosilicate frit with the addition of perlite material for decontaminating radioactive solutions were studied. Conclusions were drawn about the structure of the material formed, the optimal perlite content in the mixture, and the possibility of using the examined compositions for vitrifying highly radioactive perlite-containing pulp in accordance with the regulatory requirements.

STRUCTURE AND OPTICAL PROPERTIES OF TRANSPARENT GLASS-CERAMICS WITH Ho^{3+}:$YNbO_4$ AND Yb^{3+}, Ho^{3+}:$YNbO_4$ NANOSIZED CRYSTALS

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Transparent lithium alimunosilicate glasses and glass-ceramics (GSs) nucleated by rare-earth (RE) niobates were prepared. The structure and the role of RE niobates in phase separation and crystallization were studied by TEM, XRD, DSC and Raman spectroscopy. GSs contain tetragonal and monoclinic crystals of RE niobates with mean size of 7-15 nm and β-quartz solid solution. Optical spectroscopy confirmed that the Yb^{3+} and Ho^{3+} ions enter into the $YNbO_4$ nanocrystals.

THERMODYNAMIC PROPERTIES OF THE $SrO–Al_2O_3–SiO_2$ SYSTEM: EXPERIMENT AND MODELING

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Thermodynamic properties of the $SrO–Al_2O_3–SiO_3$ systems were studied via Knudsen mass spectrometry at 1800–2400 K. Vapor over melts contained Sr, SiO, and O_2. Partial pressures, SrO and SiO_2 activities, and partial molar enthalpies of vaporization/mixing were determined. Kohler method and generalized lattice theory of associated solutions were applied to calculate thermodynamic properties based on the binary data, showing agreement with experimental values.

CRYSTAL NUCLEATION AND GLASS STRUCTURE RELAXATION AT TEMPERATURES BELOW THE GLASS TRANSITION TEMPERATURE

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In lithium silicate glasses below the glass transition temperature, the dependence of the number of homogeneously nucleated crystals on time confirms the existence of linear sections with a systematically increasing slope, each of which corresponds to a constant value of the nucleation rate. Such kind of the nucleation rate increase toward the value predicted by the classical nucleation theory reflects the stepwise relaxation of the glass structure.

CRYSTALLIZATION OF $BaO–CaO–SiO_2–Al_2O_3–B_2O_3$ GLASS SEALANTS FOR SOFC, STUDIED BY X-RAY DIFFRACTION AND IN-SITU RAMAN SPECTROSCOPY

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Isothermal heat-treatment of low-boron part of $BaO–CaO–SiO_2–Al_2O_3–B_2O_3$ glass system revealed that higher boron oxide content inhibits bulk crystallization. Walstromite was the major crystalline phase. Sealing and operating conditions induced different crystallization. In-situ Raman spectroscopy showed low sensitivity to ongoing crystallization at operating temperatures.

APPLICATION POTENTIAL OF SEMI-TRANSPARENT ENAMELLED GLASS (STÉMALITE) IN BUILDING-INTEGRATED PHOTOVOLTAIC MODULES (BIPV)

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This study explores the potential application of semi-transparent ceramic coatings for BIPV modules. Optical and electrical tests confirmed that varying the base-to-pigment ratio enables control of transparency and power output, ensuring optimal integration into building facades.

DEVELOPMENT OF NEW METHOD FOR DETERMINING RADIOPAQUE PROPERTIES AND TESTING ON FILLERS FOR DENTAL COMPOSITE MATERIALS

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A new method for assessing radiopacity in dental glass fillers is introduced, utilizing X-ray intensity measurements. Fillers enriched with BaO and SrO exhibit enhanced radiopacity while maintaining aesthetics and strength. The new approach enhances material evaluation accuracy, benefiting clinical outcomes and future material design.

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