ION-PHOTON EMISSION OF TITANIUM-CONTAINING TARGETS AND ITS USE FOR ANALYSIS OF THE COMPOSITION OF THE SURFACE

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The basic characteristics of ion-photon emission (IPE) of titanium and its compounds such as TiN and graphite with addition of titanium (MPG-8) under bombardment by Ar^+ ions are investigated. The correlation between the electronic structure of the solid and such parameters of IPE as the kinetic energy of particles flying away, excited to a certain energy state, and the efficiency of excitation of this state is revealed. A possibility to use IPE for the layerwise analysis of the composition of a protective covering of the spiral winding of the installation 'Uragan-3" is demonstrated.

INVESTIGATION d + α SYSTEM IN KINEMATICALLY COMPLETE EXPERIMENT AT α-BEAM ENERGY 27.2 MeV

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The α + d-system was investigated in a kinematically complete experiment by ^2H (α,p α) n three-body reaction with an α-beam energy 27.2 MeV. The first excited state of ^5He was observed and its parameters were determined. Coincidence α–p- spectra were fitted by model of the sequential decay ^5He ground and excited states through the α + n channel. The best agreement with the data was obtained assuming the following ^5He first excited state parameters: $E_{\alpha n}$ = 2.8 MeV, Γ = 2.5 MeV.

IDENTIFICATION OF CERTAIN LASER TRANSITIONS OF HCOOD MOLECULE

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For the first time, five laser emission lines of HCOOD are assigned as a result of the investigation of the high resolution IR spectrum of the ν_6 fundamental band of this molecule. Rotational and centrifugal distortion parameters for the ν_6 vibrational state are determined, and the strong Fermi resonance between ν_6 and $2\nu_9$ states is noticed. The ν_6 and $2\nu_9$ band centers are derived to be, accordingly, 972.85063(10) and 1011.67669(14) cm^{-1}.

OPERATION OF LIGHT WITH THE HELP OF SPACE CHARGE WAVES

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We consider a transformation of optic directed modes into a coming out mode in a thin film light wave guide while interacting with the space charge waves. It is shown that this mechanism of transformation may be more efficient in comparison with transformation through the surface acoustic waves.

THE THRESHOLD CONTROL AND GENERATION CHARACTERISTICS OF DOPING NEMATIC LIQUID CRYSTALS

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Spectral characteristics and the lasing efficiency of nematic liquid crystlas (NLC) doped by polymethine dyes are investigated. The management of lasing thresholds in such materials by variation of the molecular director of NLC about the orientation of linear polarization of the emission pumping is studied. We show that the main cause of the low lasing efficiency of doping NLC is the scattering of light by fluctuations of the molecular director of a liquid crystal.

LOW-FREQUENCY RELAXATION IN AQUEOUS SOLUTIONS OF COBALT CHLORIDE

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The analysis of possible mechanisms of low-frequency relaxation in aqueous solutions of cobalt chloride is performed by using acoustic spectroscopy. We show that the relaxation is caused by a structural realignment of hydrated ion chains formed because of weak hydrogen-type chemical bonds. We find that, in the explored aqueous solutions like in water, the uncollective reaction turns into a collective one. The factors of correlation between the elementary steps direct and reverse reactions are calculated.

APERIODIC ELECTROPHORESIS IN WATER SOLUTIONS OF ELECTROLYTES

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The nonlinear electrophoresis component of the velocity for latex particles (dimension of 11.9 μ) is measured by the aperiodic electrophoresis method in dilute water solutions of KCl and $Al_2(SO_4)_3$ (concentration of 10^{-3} mol/l). For this purpose, we designed a new convection-stable cell which allowed us to use high-strength electric fields of up to 1600 V/cm.

INVESTIGATION OF THE POROUS SILICON AGEING PROCESS IN VARIOUS ENVIRONMENTS

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The transformation of photoluminescence (PL) and photoluminescence excitation (PLE) spectra of porous silicon samples during ageing in air, vacuum, and in water is investigated. It is found that PL intensity changes depend on the excitation wavelength that is caused by the presence of two bands in the PLE spectrum, visible and ultraviolet (UV). Under visible light excitation ($\lambda_{exp} > 490$ ‡), the photoluminescence intensity decreases mainly irrespectively of the environment used. It is shown that these changes are due to the desorption of some species, which cause the visible PLE band, from the porous silicon surface. Under UV light excitation, a complex nonmonotonic behavior of the PL intensity including regions of its increase and decrease is observed. It is shown that this PL character can be explained by two processes, namely, desorption and oxidation. It is established that, besides irreversible changes, a reversible drop of the PL intensity as well as its peak position shift to a shortwavelength region is observed due to the visible PLE band disappearance. The visible PLE band is supposed to be caused by light absorption in water clusters which contain electrolyte components.

THE STRUCTURE AND PHYSICAL PROPERTIES OF AMORPHOUS $(GeS)_{1-x}Bi_x$ THIN FILMS

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The influence of a small addition of Bi on the structure, electrophysical properties, and optical ones of germanium monosulphide thin films is investigated. Using electrographic studies, it is shown that $(GeS)_{1-x}Bi_x$ ($0 \le x \le 0.15$) films are amorphous and their structure can be described in the frame of the model, which is usually used for solid $GeS\text{–}Bi_2S_3$ solutions. Electroresistivity increases when Bi-atoms are added. At the same time, the optical gap width E_0 decreases and the reciprocal slope of the exponential region of the absorption edge $d(h\nu) / d\ln\alpha$ increases.

THERMOSTIMULATED LUMINESCENCE OF OXIDE FILMS OF ALUMINIUM PROCESSED WITH VARIOUS ELECTROLYTES

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We have studied the thermostimulated luminescence of electrochemically obtained oxide films of aluminium, modified by the reaction with aqueous solutions of some Na- and K-salts. It is determined that the anions of these salts can play role of traps as well as OH^- -ions.

THE ROLE OF THERMODONORS IN Si CRYSTALS WITH ELEVATED CONTENT OF THE OXYGEN ADMIXTURE IN FORMING THEIR ELECTROPHYSICAL PROPERTIES

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S u m m a r y

The role of formation processes of electrically-active thermodefects (thermodonors and thermoacceptors) in forming properties of oxygen-containing silicons is studied. It is shown that electrophysical properties (density of carriers, their mobility, and, correspondingly, resistivity) of oxygen-containing silicon crystals may be thoroughly changed by means of an appropriate annealing (or by a combination of annealings of different durations with different temperatures). In particular, by means of annealing, we may obtain a compensated material of *n*- and *p*-types with different degrees of compensation by using oxygen-containing *p*-Si crystals as initial material.

CALCULATION OF THE BAND STRUCTURE, EFFECTIVE MASSES, AND ELECTRON DENSITY OF $Ga_xIn_{1-x}P$ SOLID SOLUTIONS

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The electronic band structure of a ternary substitution solid solution $Ga_xIn_{1-x}P$ with zinc-blende crystal structure is calculated. The calculation is based on the modified empirical pseudopotential method in the virtual crystal approximation. The concentration dependence of energy along basic symmetric directions is found, and the temperature dependence of the $Ga_xIn_{1-x}P$ band gap is calculated. The effective masses of the conduction band, heavy holes, light holes, and split-off holes are determined as well as the electronic band density. The

theoretical results are in good agreement with the available experimental data.

RADIATIVE CHANGES OF EXCITON SPECTRA OF BLACK DIPHOSPHIDE ZINC MONOCRYSTALS

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For the first time we study the influence of various types of ionizing particles (gamma quanta, electrons), and neutrons conditions of their growing out of the gas phase on the exciton reflection spectra of black diphosphide zinc. It is established that defects of the phosphor sublattice, which are main optically active centers in the infrared range, determine the evolution of the structure of crystals during their growth under interaction with irradiation of various types.

THE INFLUENCE OF ELECTRIC FIELD ON THE PHASE TRANSITION IN $Sn_2P_2S_6$ FERROELECTRIC

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We investigate the influence of external electric field on the temperature dependence of dielectric constant for $Sn_2P_2S_6$ ferroelectric and construct the E, T_m-diagram. The revealed peculiarities on the field dependences of ε_{max} and T_m are related to the influence of defects on the domain structure and have the relaxation nature.

INFLUENCE OF A MAGNETIC FIELD ON THE GROUND-STATE OF EXCITONS IN SUPERLATTICES OF TYPE I AND TYPE II IN GaAs/AlAs

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S u m m a r y

The influence of a homogeneous magnetic field on a singlet exciton with quasiimpulse $\vec{k} \approx 0$ in GaAs/AlAs quantum wells of type I and type II is studied by the variational method within the anisotropic model of superlattices. The dependences of the average values of distances between the electron and hole on the layer thickness and magnetic field are calculated. The tresults of our calculations show that the binding energy of excitons increases with the magnetic field and decreases with growing the geometric parameters of the structure, which well agress with available experimental data.

ENERGY POSITION OF LOCAL TRAPPING LEVELS AND TEMPERATURE DEPENDENCE OF X-RAY LUMINESCENCE OF COPPER-DOPED LITHIUM TETRABORATE SINGLE CRYSTALS

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Thermostimulated luminescence (TSL) of $Li_2B_4O_7$ single crystals doped with various copper concentrations is studied. The optimal dopant concentration is found to be $19.4 \cdot 10^{-3}$ mass% of Cu. TSL of $Li_2B_4O_7$:Cu in single crystls in the 36 – 450 °C temperature range is shown to be mostly determined by releasing carriers from two local trapping levels with the energies $E_{t_1} = 0.90 \pm 0.03$ eV, $E_{t_2} = 1.72 \pm 0.07$ eV and the frequency factor of $4 \cdot 10^{10}$ and $5 \cdot 10^{16}$ s^{-1}, respectively. The presence of these local levels essentially affects the temperature dependence of X-ray luminescence. At temperatures above 215 °C, the thermal quenching of luminescence is observed, being well described by the Mott formula with the activation energy $E_a = 0.65 \pm 0.05$ eV.

INFLUENCE OF TIN IMPURITIES OF THE GENERATION AND ANNEALING OF LOW-TEMPERATURE THERMAL OXYGEN DONORS IN CZOCHRALSKI SILICON

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S u m m a r y

We study the effect of Sn impurities on the generation and annealing kinetics of oxygen-containing thermal donors formed during a 450 °C anneal step. Special attention is given to the influence of a thermal pre-heat treatment at 800 °C and the important role played by oxygen microfluctuations. The latter act as precursors for the formation of thermal donors. The qualitative theoretical model, developed for explaining the experimental results in Sn-free Czochralski Si and based on hetero- and homogeneous precipitation processes, also allows one point out a beneficial role of Sn doping on the thermal donor properties.

THE DEFINITION OF ELASTIC PROPERTIES OF NONHOMOGENEOUS MEDIA WITH RANDOM STRUCTURE

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For defining the elastic properties of nonhomogeneous media with random structure, the fractal model of structure and iterative averaging methods are used (which are based on renormgroup transformations).

Critical modulus indices for volume elastisity in the elastic and high elastic ranges and the dependence of Poission's coefficient near the percolation threshold on parameters of a non homogeneous are defined by numerical calculations. The results are in good agreement with reference data both for percolation systems and systems with finite difference in properties of nonhomogeneous medium components.

ELECTRON-DEFORMATION INTERACTION AND CARRIERS ENERGY SPECTRUM OF STRESSED SUPERLATTICES

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The ground state $E_{0,}$ of an electron as a function of quantum well thickness (L_w) in ZnSe-ZnS superlattices is calculated in the frame of the electron-deformation model. It is found that the value of $E_{0,}$ decreases continiously with increase of the electron system density (n_0) when L_w ranges from 10 to 20 Å. On the contrary, at $L_w > 20$ Å, the function $E_{0,} = f(n_0)$ displays a minimum which moves towards smaller values of n_0 if d increases.

EFFECT OF ULTRASONIC TREATMENT OF SILICON IMPATT DIODES, POWER SCHOTTKY DIODES AND ZENER DIODES ON THEIR ELECTRICAL CHARACTERISTICS

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UDC 621.382.2.

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Ultrasonic treatment of packaged silicon IMPATT diodes and power Schottky diodes is performed. It results in both a substantial reduction of the diode reverse current and improvement of the $I^- V$ curve stability. The results obtained evidence that ultrasonic treatment at room temperature stimulates a substantial modification of the impurity-defect structure of $p^- n$ junctions in the diodes studied. An ideal Shockley diode is realized in a silicon $p^- n$ junction as a result of the current mechanism changing from generation-recombination to the diffusion one. For comparison, the electrical characteristics of silicon alloy Zener diodes exposed to ultrasonic treatment are also studied.

TEMPERATURE DEPENDENCE OF DOMAIN STRUCTURE OF EPITAXIAL GARNET FERRITE FILMS WITH ELEVATED COERCIVITY

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We have researched the temperature dependence of domain structure of epitaxial garnet ferrite films with elevated coercivity composition $(Bi, Lu, Sm)_3 (Fe, Ga, Al)_5 O_{12}$. A presence of temperature hysteresis of the domain structure is experimentally displayed. A theoretical model is built which is qualitatively and quantitatively illustrative of temperature hysteresis in such films. The theoretical results obtained have a good conformance to the experimental data.

SPATIAL COHERENT STATES FOR FEW-FERMION SYSTEMS

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A simple case of spatial coherence for two- and three-fermion systems is considered. Since the wave function of fermions is antisymmetric, interference results in nontrivial peculiarities of the semiclassical behavior. The limiting state, when the Pauli exclusion principle quantum effects are essential, is a cluster ¯ a system of a few fermions with fermions being localized at the same spatial point but in different states. Such states can effectivelly manifest themselves in nuclear reactions and in coherent neutron beams.

A STUDY OF THE GAS-LIQUID CRITICAL POINT OF A BINARY SYMMETRIC MIXTURE

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The method of collective variables (CV) with a reference system is applied to a study of behaviour of a binary symmetric mixture in the vicinity of the gas-liquid critical point. The basic density measure (ρ^4

model) is constructed in the ρ_k-CV phase space which contains the variable ρ_0 connected with the order parameter of the system. Cumulants of the transition Jacobian, which take into account contributions from unessential CV, are calculated. It is shown that the problem can be reduced to the calculation of the partition function of a 3*D* Ising model in an external field. The results of calculation are presented for the critical temperature and critical density of the binary symmetric mixture of hard spheres interacting through Morse potentials.