DYHAMICAL STRUCTURE OF SPACE AND TIME

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A mathematically correct solution of the problem of ultraviolet divergences requires a radical change of our ideas on space and matter.We show that the space is a discontinuum in small which is the carrier of a new dynamical structure. Taking into account this structure, a new theory of elementary particles can be suggested.

ELECTRON POLARIZATION IN THE ELASTIC SCATTERING BY ORIENTED NUCLEI ^{7}Li,^{7}Be IN THE VARIATIONAL APPROACH

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Ultrarelativistic electron polarization in the elastic scattering by the oriented nuclei ^{7}Li,^{7}Be is calculated with model variational wave functions. The final electron polarization is shown to depend on the structure of nuclei and their orientation. A comparison with the results obtained within the many-particle oscillatory shell model is performed. A possibility of experimental verification of the consistent description of both the polarization angular dependences and quadrupole moments of the nuclei is pointed out.

PRECISE VARIATIONAL CALCULATIONS OF ENERGIES AND RADII OF D, T, ^{3}He, AND ^{4}He NUCLEI

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For various nucleon-nucleon central interaction potentials, precise variational calculations with the use of the Gaussian basis are carried out for the bound-state energies and rms radii of the lightest nuclei D, T, ^{3}He, and ^{4}He. Details of the ground-state wave functions are analyzed. Convergence and reliability of the method are studied. We propose an *NN*-potential acceptable for satisfactory description of the ground states of three and four nucleons as well as the low-energy two-nucleon data.

ELECTRON-IMPACT IONIZATION CROSS SECTIONS OF METASTABLE Sr($...4p^6 5s5p^3P_{0,2}$) ATOMS

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Electron-impact ionization of Sr atoms from metastable states is investigated using the technique of crossed atomic and electron beams. The value of the total ionization cross-section from the $5s5p^3P_j$ metastable states at an electron energy of 4 – 20 eV is determined. It is found that ionization cross-sections from metastable and ground states differ considerably. Such a discrepancy is mainly due to different mechanisms of the ion formation from the metastable and ground states. The obtained results are compared with those calculated in the binary approximation of classic mechanics.

TEMPERATURE DEPENDENCE OF THE INFRARED LUMINESCENCE OF ZnSe GROWN BY THE SUBLIMATION METHOD

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Photoluminescence (PL) spectra of undoped ZnSe crystals grown by the sublimation method are studied within the spectral range 500 – 1030 nm at $T = 100 \div 330$ K. PL was excited with N_2, He – Cd, and Ar^+ lasers. Under Ar^+ laser excitation ($h\nu_{exc} < E_g$), the IR 1.3 eV band is observed in addition to the red 1.9 eV band. The temperature dependences of the peak intensities (TD) of both bands are measured. The TD of IR band has a peak at 260 K and flattens out at $T < 180$ K. To interpret such a TD, two models are considered: the model of multicharge donor as a luminescence center and the model of simple donor. It is suggested that the IR PL band may be due to intracenter transitions between some levels of multicharge donor-like defects of the ZnSe lattice.

RAMAN SPECTRA OF ACOUSTOOPTIC $NaBi(MoO_4)_2$ CRYSTALS

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Raman spectra of $NaBi(MoO_4)_2$ single crystals are measured and the frequencies of phonon modes are determined using a fitting procedure. The symmetry species are found by selection rules. The interpretation of the Raman spectra is made in terms of the influence of defects: Mo nonstoichiometry and disordered structure in dispositions of Na^+ and Bi^{3+} ions. The peculiarity of Raman spectra is their large Raman scattering efficiency. The obtained value of the Raman scattering cross-section is 10^3 times more than that in $CaCO_3$ crystals. It can be a reason for a high acoustooptic efficiency of this material.

ELLIPSOMETRIC INVESTIGATIONS OF HfO_2, SiO_2, AND Al_2O_3 LAYERS ON SILICA GLASS

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Multiple-angle-of-incidence ellipsometric measurem'/ed on silica glass by the electron beam were made in the visible range. The obtained data suggest that there is an interstitial layer between the outer film and substrate. The refraction indices and thicknesses of layers are determined. The obtained data allow one to suppose that the interstitial layer is formed by passing the coating material through the interface inwards the polished layer.

INFLUENCE OF NONEQUILIBRIUM FACTORS ON THE DECAY OF ELECTRIC ARC PLASMA. 2. THE ROLE OF NEARSURFACE PROCESSES

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The influence of nearsurface processes on the decay of electric-arc plasma is investigated. The object of study is a pulse plasma in argon and helium with electron density of $2 \cdot 10^{16} - 10^{15}$ cm^{-3}. As is shown, electric probes are a very useful diagnostic instrument in this case. It is determined that the diffusion flow of charged particles to the wall is lowered by a factor of 50. Properties of a nearsurface layer also define the degree of heat losses of plasma. It is shown experimentally that the standard assumption of equility of temperatures of heavy particles in the nearsurface plasma and wall is not fulfilled in the nearprobe region. The greater the heat current, the greater is this discrepancy. The accomodation coefficient for heavy particles on the wall surface may be a controlling factor over their temperature.

THE EXTENDED EQUATION OF STATE AND HEIGHT ASYMMETRY OF THE GRAVITY EFFECT CLOSE TO THE INTERFACE

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The extended equations of state and the peculiarities of the field asymmetry of various properties for inhomogeneous liquids under gravity close to the interface are investigated. Based on the Van-der-Waals model of the gas of fluctuations, we show that the field asymmetry of the state equation for liquid close to the critical point is connected with interaction forces between molecules of the substance inside density fluctuations and with interaction forces between these fluctuations at distances larger than the correlation length ($r \geq R_c$). Theoretical calculations experimentally checked show that the field asymmetry of the gravity effect is also determined by the height asymmetry of the chemical potential $\Delta\mu$ of the substance under gravity close to the critical point.

ACOUSTIC SPECTROSCOPY OF $LiClO_4$ SOLUTIONS IN POLYETHYLENE OXIDES

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Structure-dynamical properties of $LiClO_4$ solutions in polyethylene oxides (PEG-300) in a wide frequency range and for concentrations from 0 to 1.0 mole/l are investigated by acoustical and rheological methods. The calculations of relaxation parameters are performed.

THE STRUCTURE-DYNAMICS PROPERTIES AQUEOUS SOLUTIONS OF NONIONIC SURFACTANTS TRITON X-100 BY USING ACOUSTIC SPECTROSCOPY

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By acoustic spectroscopy, we study aqueous solutions of nonionic surfactants Triton X-100 in the frequency range 5 – 110 MHz and in the temperature range 278 – 343 K. It is shown that the process of acoustic relaxation in solutions of small concentrations surfactants is not observed.

TEMPERATURE DEPENDENCES OF PHOTOCONDUCTIVITY SPECTRA OF CdHgTe CRYSTALS WITH PHOTOACTIVE INCLUSIONS

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The analysis of the temperature dependences of photoconductivity (PC) spectral characteristics of CdHgTe crystals with photoactive inclusions is carried out. The dependence of the form of PC spectral characteristics on the type of inclusions present in the matrix is established. The smoothing of the unmonotonic spectral relief under heating is connected with the smoothing out of the rates of Auger recombination in the matrix and in inclusions while going to the region of intrinsic conductivity. The assumption is made on the possibility of identification of the composition of inclusion phases by these characteristics. The *N*-type character of the photosensitivity temperature dependences is explained by the peculiarities of interband Auger recombination in such crystals, that determines the temperature depend-

ences of the length of diffusion drift and the effective recombination sizes of photoactive inclusions.

ON THE INTERACTION OF STRUCTURE FRAGMENTS IN INDIUM SELENIDE FILMS

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Modulation of different InSe, In_4Se_3 structures in InSe films is used for the investigation of the thermodynamic advantage at their various concentrations. The experimentally observed dependence of the type of such structures on film thickness is explained in the frame of the proposed model.

HETEROPHASE STATE AND POLYTEXTURE OF CdTe FILMS DEPOSITED FROM THE ION-MOLECULAR BEAM

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Factors defining the formation of a number of crystal textures in CdTe films are considered. It is shown that these orientations are caused by a twinning and a periodic alternation of the cubic and hexagonal phases. These processes are due to infringement of a stacking order of closely packed lattice planes during the growth of crystals.

BIREFRINGENT AND PIEZOOPTIC PROPERTIES OF $(MgSiF_6) \cdot 6H_2O$ CRYSTALS

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The birefringent and piezooptic properties of $(MgSiF_6) \cdot 6H_2O$ crystals are investigated. The second-order phase transition at $T_i = 353$ K is observed for the first time. It is shown that the investigated crystals possess properties characteristic of an incommensurate phase on the temperature range 298 to 353 K. The transition temperatures are found to be strongly depended on the history of the sample.

p-GaSe – *n*-InSe HETEROJUNCTIONS WITH PROPERTIES OF THE STRUCTURE 'SEMICONDUCTOR – THIN INSULATOR – SEMICONDUCTOR“

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The analysis of photoelectric parameters for a *p*-GaSe – *n*-InSe heterojunction is performed by taking into account the presence of a thin insulator layer at the heterojunction boundary. Its presence was detected from the capacity saturation at the forward bias of the heterojunction. This allowed us to explain the excess of the observed photo-e.m.f over the diffusion potential and a slight deviation of current-voltage characteristics from ideal ones.

ABSORPTION SPECTRA OF $(C_2H_5NH_3)_2CuCl_4$ CRYSTALS IN THE REGION OF PHASE TRANSITIONS

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The absorption spectra of $(C_2H_5NH_3)_2CuCl_4$ (EA-$CuCl_4$) crystals are investigated in the visible and IR regions. In heating run, a new phase transition is found at $T^* \approx 338$ K. Absorption bands corresponding to the internal transitions in Cu^{2+} ion are investigated. It is shown that increasing the temperature and rising the sample irradiation dose are analogous by their influence and are followed by increasing the tetragonal distortion of $CuCl_6$ octahedra. Irradiation of the sample, in particular, leads, to breaking and the subsequent reconstruction of the H-bond network.

THE THEORY OF AC HALL MOBILITY AND MAGNETORESISTANCE IN POLYCRYSTALLINE SYSTEMS

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The theory of AC Hall mobility and magnetoresistance for systems that consist of randomly oriented anisotropic crystallites is developed by using the effective-medium theory. The large frequency region $\omega > \tau^{-1}$ (τ is the electron mean free time) is investigated, and it is shown that the real parts of Hall mobility and magnetoresistance have low- and high-frequency plateaus. The high-frequency plateau begins in the vicinity of the frequency $\omega_0 \approx \tau_M^{-1}$, where τ_M is the Maxwell relaxation time ($\tau_M >> \tau$). In the frequency region $\omega > \tau^{-1}$, all investigated values vanish.

PECULIARITIES OF SEEKING FOR SOLUTIONS OF PHASE EQUATIONS IN THE SCATTERING THEORY ON THE CALCULATIONS OF THE PHYSICAL PROPERTIES OF METALS

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Generalized dependences for calculation of the phase characteristics of scattering in the theory of metals at a wide energy region are found. The formulas can be used for calculating electronic properties of metals and to solve various problems of nuclear physics or elementary particle physics. On the basis of the method of phase functions, a shift of the bound state energy regarding to the Coulomb term and the quantum-defect value by the example of a model pseudopotential are calculated.

ASSOCIATIVE EFFECTS IN DIPOLE SYSTEMS: INFLUENCE ON CRITICAL BEHAVIOUR

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S u m m a r y

The influence of dipole-dipole interaction on the phase transition 'liq-uid-gas“ in the frame of the model of hard spheres with dipole momentum and additional isotropic attractive interaction is studied. The linear terms of dipole-dipole interaction are described in the mean spherical approximation, and nonlinear terms in the dimer and polymer approximations of the theory of associative liquids. It is shown that the dipole interaction leads to decreasing the critical density and increasing the critical temperature.

THE MUNSTER METHOD FOR THE THREE-MOMENT APPROXIMATION AND SHIFTS OF CRITICAL PARAMETERS IN AN ANISOTROPIC INFINITE SYSTEM

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The modified Munster method is used to study anisotropic systems in the three-moment approximation. The essence of this method consists in a finding of consequent iterations for the direct and pair correlation functions with the help of the integral and differential Ornstein ¯ Zernike equations. The first iterations for the direct and pair correlation functions in a spatially infinite anisotropic system are received. Shifts of the critical temperature and density and their connection with anisotropy parameters of the system are found.

OPTIMIZATION OF MUELLER-POLARIMETER PARAMETERS IN STUDING OF DETERMINISTIC OBJECTS BY THE METHOD OF THREE POLARIZATIONS

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We carry out the optimization of polarimeter parameters to minimize measurement errors for Mueller matrix elements when it is known that the studied object belongs to the deterministic class. We minimize the condition number of the characteristic matrix of a system of linear equations, from which the Mueller matrix elements are obtained, by choosing polarization states of radiation in the probing channel of a polarimeter. A minimal value of the condition number and the set of polarizations of probing radiation which maintain this value are obtained.