

Summaries

UDC 514.76

A.A. Luchinin
**ABOUT ONE CLASS OF PAIRS n -SURFACES
IN $(n+2)$ -DIMENSIONAL PROJECTIVE SPACE**

Two n -dimensional surfaces in $(n+2)$ -dimensional projective space between which points dot conformity is established are studied. Some geometrical objects connected to pair of surfaces are considered. Consideration everywhere has local character. All used functions are assumed analytical.

UDC 541.127

V.M. Belov, S.A. Goncharov, E.V. Ryabova, V.V. Evstigneev
**PARAMETERS DEFINITION
OF UNCERTAINTY ELLIPSES AT TWO**

Parameters definition of empirical dependence at two measurements with use of the uncertainty ellipse algorithm in the generalized method of uncertainty center has been considered. The algorithm of optimum parameters definition is offered.

UDC 621.0

V.A. Dubovik, E.N. Pashkov
**STATIONARY ROTATION STABILITY
OF UNBALANCED ROTOR WITH LIQUID
AUTOBALANCING DEVICE ON FLEXIBLE SHAFT**

The condition of rotor rotation stability with liquid autobalancing device consisting of chamber, float and incompressible homogeneous liquid filling the space between them has been obtained. The restoring force and forces of internal and external friction take effect on the rotor. The latter are linearly depend respectively on speed of deformation and absolute speed of connection point of rotor to the shaft.

UDC 621.833

V.S. Yangulov
**WAVE TRANSFERS WITH INTERMEDIATE BODIES (CONDITION,
RESULTS AND PROBLEMS)**

The results of practical application of wave transfers with intermediate bodies have been shown. The analysis of the reasons which interfere with their introduction in a batch production has been given. Priorities on elimination of these reasons have been set. The main directions of their solution have been defined.

UDC 621.833

V.S. Yangulov
PRECISION REDUCER WITH INCREASED DURABILITY

The results of works on creation of the precision reducer which is a part of space vessels have been presented. Modular construction of reducer design on the basis of wave transfers with intermediate bodies of rolling motion has been described. The design of the reducer with modular construction of kinematic circuit has been offered, where transfers with adaptive generators are applied providing an elastic tightness in the interlock.

UDC 621.9.02

A.A. Bakanov
**SEARCH FOR THE OPTIMUM DESIGN OF SECTIONAL DRILLS
WITH REPLACEABLE MANY-SIDED PLATES AT DRILLING
RAILWAY RAILS**

The technique of power analysis of modular drills with replaceable many-sided plates at drilling railway rails has been offered, which

has allowed raising working capacity of the tool. The technique is based on summation of specific components of cutting force on length of working areas of cutting edges of plates. Increase of working capacity is reached due to reduction of radial components of cutting force from each of the plates.

UDC 621.757 (031)

A.N. Zhuravlyov, M.A. Borisov
QUALITY ESTIMATION OF STRUCTURALLY ORDERED ASSEMBLY UNDER WELDING OF CARVING CONNECTIONS

Structurally ordered assembly under welding of carving connections has been considered, allowing providing high accuracy of a product connected details relative positioning.

UDC 681.2

**V.S. Dmitriev, T.G. Kostyuchenko,
V.S. Yangulov, V.V. Teplouhov**
**MOBILE LIDARS. INFLUENCE OF EXTERNAL MECHANICAL
ACTIONS ON ACCURACY OF LIDAR AIMING**

Questions on designing power elements of mechanical system "lidar radiator – lidar basis – automobile" in order to reduce external mechanical influences on accuracy of lidar aiming are considered.

UDC 621.375.826: (621.397:535)

M.S. Slobodyan, S.M. Slobodyan, A.A. Tsupin
LARGE-FORMAT LASER RANGE

The new principle of wide format scanning laser range construction for mobile objects navigation, realized on the basis of piezoelectric drive of laser beam inclination management has been offered. Optimum parameters of the drive and laws of scanning management of the range laser beam have been defined. The limiting angular format by azimuthal coordinate (the most important for navigation of water and ground mobile objects) up to the size of a hemisphere is 180° . The offered principle is approved in adaptive television automatic system, means of control and diagnostics of laser beam condition at stochastic influences

UDC 535.211

V.I. Ivanov, Yu.M. Karpets, K.N. Okishev, A.I. Livashvili
**THERMODIFFUSION ENLIGHTENMENT MECHANISM OF
TWO-COMPONENT ENVIRONMENT T BY LASER RADIATION**

Thermodiffusion enlightenment mechanism of liquid phase environment with absorbing particles under the influence of laser radiation has been analyzed. The enlightenment of water suspension of carbon particles under the influence of He-Ne laser radiation has been experimentally investigated. Efficiency of amplitude dynamic holograms record in two-component environments with thermodiffusion mechanism of absorption coefficient modulation has been investigated.

UDC 535.36

B.V. Goryachev, S.B. Mogilnitsky
**RADIATION TRANSFER IN DISPERSION MEDIUM
IN SEPARATING**

Investigated was the influence of the separation degree of dispersion medium upon the radiation balance in view of its optical dimensions, scattering phase function, and albedo of single scattering. It was stated that the enlightenment effect arising in separating the dispersion medium has certain spatial borders. Suggested was the classical concept specification of the "infinitely extended dispersion medium".

UDC 519.713

I.V. Fedotov
MODELING OF WAVE DISTRIBUTION IN LAYERED INHOMOGENEOUS ENVIRONMENT CONTAINING STREAM OF DISCRETE INHOMOGENEITIES

The algorithm of wave distribution modeling in layered random environment containing stream of discrete inhomogeneities has been developed and realized. Dependences of dispersed and absorbed signal energies from parameters describing inhomogenous structure of random layered environment and stream of inhomogeneities have been investigated. Numerical calculations of angular spectrum of dispersed signal have been conducted. The frequency spectrum analysis of signal that passed through a stream of discrete inhomogeneities has been made.

UDC 539.12.04; 621.039.587

A.I. Pushkarev, R.V. Sazonov
RESEARCH OF HIGH-CURRENT IMPULSE ELECTRONIC BEAM ENERGY DISTRIBUTION ALONG DEPTH OF SHEET OF WATER

Measurements of distribution along depth of sheet of water of the absorbed dose and energy of the high-current impulse electronic beam formed by accelerator TEU-500 (350...500 kV, 60 ns, current density 0.3...0.4 kA/cm²) have been performed. The high-resolution measurement technique of dose and energy distribution with application of dosimetric film based on lavsan with phenasine covering has been used. Spatial resolution at registration of the absorbed dose in the range of 5...100 kGr makes 20...30 mkm. It has been shown that at absorption of electronic beam with high density current (in conditions of track overlapping on surface of the absorbing layer) distribution of the absorbed dose along depth within the limits of $\pm 10\%$ coincides with distribution obtained for low-current beam.

UDC 621.384.6

T.S. Ivanilova, V.V. Kashkovsky
BORDER OF ELECTRONIC BEAM RELEASE IN BETATRONE WITH CREST TYPE POLES

The release border of electronic beam in Betatrone with crest type poles has been defined. It has been shown that during the moment of beam output the release of electrons from influence of focusing forces of electromagnetic field occurs on the border of crest and cavity of Betatrone poles. Beam particles during the output process are grouped on the azimuths located near lateral edges of pole crests. The results of researches can find application in practice at formation system engineering and output of Betatrone electronic beam.

UDC 537.533.7

A.S. Gogolev, A.P. Potylitsyn
COMPARISON OF X-RAY RADIATION SOURCES ON THE BASIS OF BRAKE AND PARAMETRICAL RADIATIONS

The comparative analysis of the x-ray tube and source on the basis of parametrical X-ray radiation has been conducted. The intensity of source parametrical radiation on the basis of compact linear accelerator with beam energy 6 MeV and current 100 mA is compared with intensity of standard X-ray tube. The opportunity of smooth change of radiation energy of parametrical radiation in a wide power range from 6 up to 130 keV with line width of about 300 eV will raise the contrast of received image and will lower the dose loading.

UDC 539.122.185

O.V. Bogdanov, K.B. Korotchenko, Yu.L. Pivovarov
EVOLUTION OF RADIATION SPECTRA OF RELATIVISTIC POSITRONS AT (100) AND (111) CHANNELING IN Si WITH CHANGE OF ENTRY ANGLE AND ENERGY OF PARTICLES

Evolution of radiation spectral intensity has been investigated at (111) positron channeling in thin crystals Si with increase in energy of positrons from 100 up to 300 MeV and change of their entry angle. It

has been revealed that spectra have more complex structure and a full output of radiation is few times higher than at (100) or (110) channeling, which can be explained by presence of additional group of positrons on cross-section energy.

UDC 621.039.51

P.M. Gavrilov, A.G. Kohomskiy, K.M. Izmestiev, I.N. Seelev, M.E. Silaev
GAMMA-SPECTROMETRIC METHOD TO CONTROL ACTIVITY AND NUCLIDE COMPOSITION OF GASEOUS RADIOACTIVE WASTE FORMED AT OPERATION OF NUCLEAR POWER-PLANTS

Gamma-spectrometric method was developed to monitor continuously and on-line radioactivity and nuclide composition of inert radioactive gases, radioactive aerosols and iodine in gas-aerosol emissions from power reactor facilities. This method is based on continuous representative sampling of gas-aerosol samples and quasicontinuous automated recording of nuclide composition and radioactive material emission rate. Low detectable level of the method is about 0,1 Bq/m³, highest detectable level for noble gases is about 10² Bq/m³.

UDC 535.372

L.A. Lisitsyna, V.I. Oleshko, V.M. Lisitsyn, S.N. Putitseva
KINETIC PARAMETERS OF THE URANIUM LUMINESCENCE IN LiF CRYSTALS

The results of researches with nanosecond time resolution of kinetic characteristics of process of an increase and decay of luminescence in crystals LiF(U)-O at 300 K under both of the laser pulse with energy 3,68 eV and the electron pulse with energy 300 keV have been presented. Influence of excite method on kinetic characteristics of uranium luminescence and uranium influence on kinetic characteristics of oxygen luminescence in crystal have been established.

UDC 544.54; 544.55

V.A. Vlasov, A.I. Pushkarev, G.E. Remnev, R.V. Sazonov, S.A. Sosnovsky
NONEQUILIBRIUM PLASMACHEMICAL PROCESSES - BASIS OF FUTURE PLASMA TECHNOLOGIES

Laws of molecule excitation in basic electronic condition have been considered. It has been shown that for initiation of chemical reactions the nonequilibrium excitation of oscillatory degrees of molecule freedom is the most effective. Proceeding in such conditions plasmacchemical processes have a number of advantages allowing at their use in traditional manufactures to lower power inputs and to increase productivity. Conditions realized at impulse excitation of gas mixes are also favorable for organization of chain chemical processes. Experimental data of chain chemical processes realization in plasma of impulse electronic beam have been presented. Other perspective plasma technologies have been also considered - impulse radiolysis of liquid phase hydrocarbons at low temperature in conditions of electronic beam influence with high current density, initiation of carbon-black formation process in nonequilibrium conditions.

UDC 537.9

Yu.Yu. Lutsenko, V.A. Vlasov, Yu.V. Venderevskaya
FEATURES OF HIGH-FREQUENCY CAPACITOR DISCHARGE BURNING PROCESS IN ENVIRONMENTS WITH DISPERSE PHASE

Measurements of current, voltage and amplitude of electric field of sprayed high-frequency capacitor discharge have been conducted. Increase in the current proceeding in discharge at its spraying by substances with potential ionization less than 7 V has been established. Calculations of electromagnetic wave parameters extending in sprayed high-frequency capacitor discharge have been conducted. The absence of characteristics change in discharge electromagnetic field at degrees of its spraying $\nu < 10^{-2}$ have been shown.

UDC 621.315.592

V.V. Parashchuk, K.I. Rusakov
DYNAMICS OF STREAMER DISCHARGE
DEVELOPMENT IN SEMICONDUCTORS

Space-time dynamics of streamer discharges in semiconductors in view of processes of shock (tunnel and photo-) ionization, radiating spontaneous and stimulated recombination, and also electron-photon interaction in a strong electric field has been modeled. The possibility of formation in these conditions of space-non-uniform dissipative structures, self-oscillatory regular and other modes has been shown; their laws and interrelation with dynamics of streamer laser discharge have been established. Nonmonotonic dependence of system characteristics on key parameters – speeds of excitation, life time of non-equilibrium carriers and photons, quantum efficiency of active environment, and also strengthening of structure interaction in conditions of stimulated recombination causing variety of own system dynamics have been revealed. Radiating processes provide high speed of structure distribution compared with phase speed of light, and are the basic generation mechanism of nonequilibrium carriers in self-oscillatory mode respective to optimum conditions of streamer occurrence and development.

UDC 539.194,535.621,535.34

V.N. Stroynova
RELAXATION PARAMETERS OF ABSORPTION LINES
OF OSCILLATORY EXCITED MOLECULE HF

The design model allowing receiving authentic values of half-width and shift of line centers of molecule HF of hot and cold strips down to dissociation limit has been constructed. Calculation results of rotary and oscillatory dependences of relaxation parameters of lines HF-HF have been received.

UDC 539.194,535.621

V.N. Stroynova
HALF-WIDTH AND SHIFT OF LINE CENTERS FORMED
BY TRANSITIONS ON HIGH-EXCITED OSCILLATORY CON-
DITIONS OF MOLECULE CO

Within the limits of the offered model, calculations of half-width and shift of centers of spectral lines formed by transitions on high-lying oscillatory conditions of molecule CO down to dissociation limit have been conducted. The presented results allow investigating kinetic processes and characteristics of CO-laser cold plasma.

UDC 535:548.0

G.G. Zdorovtsev, V.I. Ivanov, Yu.M. Karpets, S.V. Klimentyev
THERMOELECTRIC PROPERTIES OF ASYMMETRICAL
SANDWICH STRUCTURE METAL-NIOBATES LITHIUM-ME-
TAL

Based on the model with internal EDS source the approximation of experimental dependences of thermostimulated EDS in the alloyed crystal of niobates lithium with pair of electrodes from different metals from crystal sizes, its temperature, concentration of alloying impurity has been conducted. Use of structure metal-niobates lithium-metal as a sensitive element of the thermal radiation receiver has been shown.

UDC 539.32:548.053

A.A. Botaki, E.V. Pozdeeva
ELASTICITY MODULES AND ACOUSTIC PROPERTIES
OF METAL CERAMICS ON THE BASIS OF TUNGSTEN MONO-
CARBIDE

The results of measurements of acoustic wave speeds and elasticity modules of metal-ceramic alloys on the basis of tungsten monocarbide in temperature range of 100...295 K, and also amplitude dependences of internal friction at temperatures 140...295 K and after γ -irradiation (^{60}Co , 1,25 MeV, $5 \cdot 10^3$ and 10^5 Gr) have been presented. It has been shown that elasticity modules of alloys monotonously decrease with increase in concentration of cobalt. Radiation influence sti-

mulates the processes complicating movement of grain-boundary dispositions in alloys. Representation of these alloys in the form of isotropic mixes of anisotropic phases qualitatively correctly describes dependence of elasticity modules on structure. The resulted experimental and calculated values of elasticity modules can be used for estimation of elastic and strength properties of these alloys.

UDC 669.295:539.25:539.382

G.P. Grabovetskaya, E.N. Melnikova, I.P. Chernov
STRUCTURAL-PHASE STATE AND MECHANICAL
PROPERTIES OF SUBMICROCRYSTALLINE TITANIUM ALLOY
Ti-6Al-4V OBTAINED WITH USE OF REVERSIBLE ALLOYING
BY HYDROGEN

Evolution features of structural-phase state of titanium alloy Ti-6Al-4V during the process of submicrocrystalline structure formation with use of reversible alloying by hydrogen have been investigated by methods of electronic-microscopic and X-ray diffractum analyses. The influence of alloying by hydrogen on mechanical properties at stretching of submicrocrystalline Ti-6Al-4V titanium alloy in temperature interval of 293...1023 K has been studied. Possible reasons of increase in strength and fluidity and reduction of deformation before destruction of submicrocrystalline alloy Ti-6Al-4V in temperature interval 873...1023 K at alloying by hydrogen in quantity 0,08...0,33 mas. % are discussed.

UDC 536.46

V.Yu. Filimonov, M.V. Loginova
FORMATION OF PHASE STRUCTURE IN THE SYSTEM Ti-3Al
AT THE STAGE OF SECONDARY STRUCTURIZATION AT
SYNTHESIS IN THE MODE OF THERMAL EXPLOSION

Features of phase formation processes in the system Ti-3Al at realization of self-extending synthesis in the mode of thermal explosion have been established with use of technological reactor enabling instant switching-off of the heating source. The analysis of synthesis finished products allows to draw a conclusion that phase structure of charge is abnormally depends on sizes of titan particles. The single-phase product corresponding to initial stoichiometry is synthesized on fine and large fractions for the induction period. On intermediate fraction the product of synthesis is multiphase.

UDC 538.9:621.785.6

M.K. Skakov, E.B. Mukazhanov, D. Erbolatuly, Zh.M. Isaeva
CHANGE OF THE SPRING Cr-Ni ALLOY MICROSTRUCTURE
AFTER AGEING

It has been established that ageing of the tempered alloy 47XHM at temperature 500 °C during 5...10 hours does not lead to disintegration of oversaturated firm solution, at rise in ageing temperature up to 600 °C attributes of disintegration in particles of α -phase of homogeneous type start to be shown. It has been shown that after tempered samples ageing at 700 °C the faltering disintegration with allocation of not coherent β -phase on the basis of chrome intensively develops, and its volume fraction increases with increase in ageing time reaching the maximal values in 5...10 hours of ageing.

UDC 538.9:621.785.6

E.B. Mukazhanov, M.K. Skakov, Zh.M. Isaeva, D. Erbolatuly
FEATURES OF MECHANICAL PROPERTIES CHANGE OF DI-
SPERSION-HARDENING ALLOY 47XHM AT TEMPERING AND
AGEING

Mechanical properties of nickel-chromic austenitic alloy 47XHM have been studied. It has been shown that with increase in time of heating under tempering the deforming pressures fall, there is a growth of plasticity which is connected with dissolution of superfluous α -phase. In order to obtain high strength properties with minimum level of elastic imperfections the thermal processing of alloy is necessary to conduct in temperature interval of 650...750 °C, and time of ageing should make from 8 up to 20 hours, depending on temperature of ageing.

UDC 536.46

V.V. Evstigneev
ALTAY CENTRE OF SCIENCE «THERMOSYNTHESIS» ON
HIGH-TEMPERATURE SYNTHESIS OF NEW MATERIALS.
CONDITION AND PROSPECTS

Achievements of problem research laboratory SVS-materialogy created in 1992 on the basis of I.I. Polzunov's Altay State Technical University have been stated.

UDC 53.082.5

A.V. Eskov, V.I. Yakovlev
AUTOMATED EXPERIMENTAL COMPLEX OF RESEARCH
AND CONTROL OF DETONATION STREAM AT PARTICLE
SPRAYING

The opportunity of application of the image input system to PC on the basis of PZS with electronic shutter and exposition time 35,5 mks in structure of complex of optical control of particle spraying detonation stream characteristics on installation "Katun-M" is shown. Results of inspection of particle speeds along the length of their tracks on image, dynamics of gas fuse formation during the initial moment of stream occurrence on section of installation shaft and root angle of the stream are resulted.

UDC 519.713:007.52

M.A. Gumirov
PYROMETRY OF SELF-EXTENDING HIGH-TEMPERATURE
SYNTHESIS PROCESSES

The developed method of brightness pyrometry used for temperature measurement in processes of self-extending high-temperature synthesis, plasmathermal spraying of moving and motionless environments has been described. MPD-photo diodes, working in a mode of direct detecting or charge accumulation, are sensitive elements of optoelectronic track of the device. Change of light signal intensity created by surface of reacting substances is registered in two microareas. Research results of temperature, distribution speed of burning front from time and quantitative content of titan carbide in a stock, and also hardness of sintered samples of the Fe_3O_4 , Al+TiC system are shown.

UDC 548.4; 539.1

V.L. Orlov, A.V. Orlov, G.N. Leonov,
Yu.B. KIRSTA, A.A. Grebenkov
CHANGE IN STABILITY OF FIRM SOLUTION
AT RADIATION INFLUENCE

Stability of firm solution at radiating influence has been investigated. Expressions for diffusion streams of binary alloy components, which specify existence of temperature interval in which the phenomenon of ascending diffusion of elements is observed, have been received. Vacancy characters of diffusion, configuration entropy, and potential energy of internuclear connections have been considered at derivation. Ascending diffusion testifies to stability infringement of homogeneous firm solution – stratification. Influence of radiation is connected with increase in concentration of vacancies which changes the energy of internuclear connections and, simultaneously, accelerates diffusion processes. The condition of alloy stability with regard to stratification at radiating influence has been obtained.

UDC 66.796.2

N.P. Tubalov, O.A. Lebedeva
STRUCTURE AND OPERATIONAL PROPERTIES OF POROUS
METAL-CERAMIC MATERIALS ON THE BASIS OF ALLOYED
STEEL SCALE

Compositions of stocks for development of porous metal-ceramic materials on the basis of alloyed steel scale with addition of ferrosilicon have been developed. Roentgenograms of the received alloys have been shown, mechanical durability and porosity of the received materials has been investigated. The model of porous metal-ceramic materials formation is offered.

UDC 66.796.2

A.A. Geyneman, V.D. Goncharov,
A.L. Novoselov, N.Yu. Shchetinkina
PURIFICATION OF GAS AND LIQUID ENVIRONMENTS BY
METAL-CERAMIC SVS-FILTERS

Industrial samples of thin purification filters of gas and liquid environments from mechanical microparticles have been developed. The basis of filters consists in porous permeable metal-ceramic materials obtained by self-extending high-temperature synthesis.

UDC 54.058:553.611.6

S.S. Orazova, V.M. Belov, V.V. Yevstigneyev
EFFICIENCY OF EAST KAZAKHSTAN NATURAL SORBENTS
USE IN WATER PURIFICATION FROM IONS OF HEAVY ME-
TALS (Cu^{2+})

Sorption properties of bentonite clays of East Kazakhstan on the example of modeling solutions containing ions of copper (Cu^{2+}) have been studied. The mechanism of exchange and degree of ion extraction from solutions has been established.

UDC 621.316.8: 678.01:537.311

V.V. Yevstigneyev, T.M. Halina, M.V. Halin
CALCULATION OF STATIONARY ELECTRIC FIELDS
IN QUASIHOMOGENEOUS ENVIRONMENTS OF MULTIELEC-
TRODE COMPOSITE ELECTROHEATERS

Theoretical bases of parameters calculation of stationary electric fields in quasihomogeneous environments of multielectrode composite electroheaters on the basis of methods of direct definition of field intensity and conformal transformations are shown. Calculated models, exact and approximate formulas necessary for definition of electric conductivity of various electroheaters are offered. Experimental acknowledgement of quasihomogeneity of resistive layer on specific electrical conductivity is presented.

UDC 378.147.31

V.V. Yevstigneyev, T.V. Kotyrlo, I.V. Belitsyn, A.V. Makarov
PROBLEM LEARNING AND INTERSUBJECT CONNECTIONS AT
PHYSICS LEARNING WITH USE OF COMPUTER EXPERIMENT
IN TECHNICAL COLLEGE

The technique of inclusion of computer demonstrations and computer experiment for problem learning, stimulating resolution of problem situation is presented. The way of student motivation to mastering new knowledge on intersubject connection between studied here and now subject with disciplines which will be studied later is shown. The fragment of lecture on physics with use of computer experiment and intersubject connection with TOE course with creation of problem situations is resulted.