Summaries

UDC 514.76

Ivlev E.T., Luchinin A.A.
ON DIFFERENTIABLE MAPPING OF EUCLIDEAN SPACE E_m INTO AFFINE A_n ($m<n$)

Differentiable mapping $V_m^n: E_m \to A_n$ ($m<n$) of Euclidean space E_m into affine space A_n has been examined. Fields of two-dimensional areas in E_m and A_n determined by the components of fundamental geometric display object Vmn in terms of G.F. Laptev are studied.

UDC 517.3

Churikov V.A.
PROGRAM AND PRINCIPLES OF CONSTRUCTING FRACTIONAL ANALYSIS

Program of constructing analysis with nonintegral orders of integration and differentiation has been proposed. It is shown that for each real order s the internally closed theory (branch) of analysis may be constructed if functions of this theory are expressed in terms of series with fractional degrees with a proper fractional step s. Each branch has its individual set of elementary and other important functions.

UDC 517.3

Churikov V.A.
INTERNAL ALGEBRA OF FRACTIONAL INTEGRO–DIFFERENTIATION OPERATORS

Spaces of Hadamard operators and operator vectors have been introduced. Operations of multiplication by a number, addition and multiplication are determined and their algebraic structure is ascertained. Topological properties of Hadamard operator space are examined.

UDC 519.17

Bykov V.V.
POLYNOMIAL SUFFICIENT CONDITIONS OF HYPERGRAPH PLANE REALIZABILITY

Theorem determining sufficient conditions of existing planar hypergraph realization has been proved. The efficient procedure of constructing such realization is proposed. It is shown that in the category of planar hypergraphs the plane realizability is a symmetric and monotone property.

UDC 519.233.22

Markov A.S.
SEQUENTIAL IDENTIFICATION OF THRESHOLD AUTOREGRESSION

In order to estimate parameters of threshold autoregression the sequential estimators by the least-squares method have been proposed. Joint asymptotic distribution of errors of estimation was obtained. The results of numerical experiments are given.

UDC 519.2

Kitaeva A.V., Koshkin G.M.
KERNEL ESTIMATIONS OF BASIC FUNCTIONALS BY DEPENDENT OBSERVATIONS

Properties of estimations of basic functionals constructed by observations meeting the strong mixing condition have been examined. It is shown that the order of convergence rate in root-mean-square of optimal kernel estimations of basic functionals for weakly dependent observations is the same as for independent ones. The order of convergence rate in root-mean-square of the forth moments of deviations of basic functional estimations is determined as well.

UDC 621.01

Dvornikov L.T., Stepanov A.V.
ON THE ISSUE OF MECHANISM CLASSIFICATION

The variant of development of kinematic chain structural classification proposed by academician I.I. Artobolevskiy has been described. Mechanism of partitioning five families of mechanisms into subfamilies based on application of a group of used kinematic pairs as subfamily character was examined.

UDC 621.01

Gudimova L.N., Dvornikov L.T., Bolshakov N.S.
THE PROBLEM OF LAYERED STRUCTURE OF PLAIN LINKWORK LINKAGE MECHANISMS

The necessity of presentation of mechanism kinematic diagrams in profile plane at the stage of kinematic and kinetostatic investigation has been shown and substantiated. The concept of layered structure is disclosed and the examples of constructing kinematic diagrams in profile plane depending on reciprocal motion of links relative to each other are given.

UDC 681.3:621.01

Stepanov A.V.
FOUNDATION OF COMPUTER SYNTHESIS OF STRUCTURES OF PLANAR PIN MECHANISMS

The fundamentally new approach to the problem of computer synthesis of mechanical system structure has been described. It is based on use of universal structural system and object-oriented methodology of forming block diagrams of planar pin mechanisms.

UDC 534.1

Dubovik V.A., Zamyatin V.M., Ziyakaev G.R.
STATIONARY ROTATION OF UNBALANCED ROTOR AT A FLEXIBLE SHAFT WITH PENDULUM BRACKETS

Conditions of existing and stability of synchronous motions of unbalanced rotor with two pendulums having bracket common axis of have been obtained. The influence of this axis disagreement with rotor shaft on system self-balance was stated.

UDC 621.833

Yangulov V.S.
KINEMATIC ERROR OF WAVE GEAR WITH INTERMEDIATE ROLLING BODIES

Algorithm of calculation of turning errors of output shaft of wave gear with intermediate rolling bodies has been given. Known principles of vector and probabilistic representation of errors of producing and assembling parts and nodes of transformation are taken as a principle of calculation. Vectors are summed subject to the frequency of their occurrence.

UDC 674.053:621.935

Shilko V.K., Slepchenko I.V., Legostaev V.G., Kondratyuk A.A.
ROLE OF CRITICAL FORCES IN DETERMINING BAND SAWS STABILITY

Stability loss mechanism of for saws with different width has been examined within the bounds of general positions on stability theory of band saw. The experimental data on critical force estimation being of interest for practical use are given. Insignificant influence of critical forces on stability of narrow band saws for which the mechanism of bending origination differs from mechanisms of bending occurrence on wide bans saws is shown.

UDC 621.9

Petrushin S.I., Proskokov A.V.
CHIP FORMATION WITH THE DEVELOPED AREA OF PLASTIC DEFORMATIONS AT MATERIAL CUTTING

The diagram of chip formation with the developed area of plastic deformations on the basis of fields of slide lines has been proposed. Derivation of equations for plastic area boundary lines is shown. The technique and example of calculation of internal and contact voltages are given.

UDC 621.787

Skvortsov V.F., Okhotin I.S., Arlyapov A.Yu.
INFLUENCE OF BLANK THICK-WALL DEGREE ON THE PROCESS OF HOLE MANDRELLING CARRIED OUT AT HIGH ALLOWANCE

The results of the experimental investigations of the influence of blank thick-wall degree in the range of its change 2,3...6,5 on the process of aperture burnishing carried out at great tightness have been given. It was stated that at burnishing tightness exceeding certain value at increase of thick-wall degree in the given range the monotonous growth of deforming force occurs and plastic deformations cover the whole blank cross-section. In this case the volume of metal displaced off the aperture to the blank ends grows at increase of their thick-wall degree, burnishing tightness and a number of its cycles and does not almost depend on aperture depth.

UDC 530.1:517.957

Lisok A.L., Trifonov A.Yu., Shapovalov A.V.
SEMICLASSICAL SYMMETRIES OF THE HARTREE TYPE EQUATION WITH QUADRATIC OPERATOR

Properties of symmetry of Hartree type equation with quadratic operator are investigated. Reduction of initial nonlinear problem to the linear one was carried out. Families of operators of symmetry of initial nonlinear integro-differential equation were constructed in explicit form.

UDC 537.874.4

Keller Yu.A.
STUDYING THE INFLUENCE OF THIN CONDUCTORS ON BISTATIC SCATTERING SECTIONS OF DIELECTRIC ELLIPSOID

The solution of the problem of scattering electromagnetic waves at three-dimensional magnetodielectric body with thin conductors near it which are placed randomly in the space relative to the body has been obtained on the basis of the method of additional sources. The constructed algorithm was implemented in the form of computer program for calculating scattering characteristics of a number of structures differing in positional relationship of bodies included in them. Thin conductor influence on bistatic scattering sections of dielectric ellipsoid was studied.

UDC 53.072;531.43;539.62

Smolin A.Yu., Dobrynin S.A., Psakhie S.G.
FACTORS DETERMINING ELASTIC WAVE GENERATION AT FRICTION. SIMULATION ON THE BASIS OF DISCRETE-CONTINUAL APPROACH

The model of mechanical interaction in contact spot at sliding friction has been examined on the basis of discrete-continual approach. Frequency spectrum of occurring elastic waves was analyzed, presence of frequencies depending on profile roughness of interacting surfaces was shown. Analysis carried out by Fourier- and wavelet-transformations allowed determining complex structure of elastic waves occurring at friction. The conclusion was drawn that the laws of wear process may be studied on the basis of the analysis of proper acoustic spectrum.

UDC 539.21

Psakhie S.G., Zolnikov K.P., Rudenskii G.E., Dmitriev A.I., Konovalenko Iv.S., Zheleznyakov A.V., Menschikova T.V.
SIMULATION OF NANOSTRUCTURE BEHAVIOR ON THE BASIS OF BILAYERED FILMS. SIZE FACTOR INFLUENCE

The behavior of open nanostructures formed on the basis of double-coating films of Ni and Cu has been examined within the bounds of molecular dynamics method. Interatomic interaction was described within the bounds of the method of embeded atom. The dependence of vibration amplitude on original film sizes was studied and geometrics at which nanostructure oscillates with maximum possible amplitude were determined. The obtained results are of interest for development of components of nanodevices of different functions.

UDC 544.77.022.524

An V.V., Yavorovsky N.A., De Izarra Sh.
FORMATION OF NANOFIBERS AT PULSE HIGH-ENERGY ACTION ON MIXTURES OF ALUMINUM AND NICKEL NANOPOWDERS

The results of studying the formation of nanofibers of intermetallides in the system Al-Ni at high-temperature synthesis have been given. The processes of ignition by CO_2-laser (λ=10,6 mkm) of equimolar mixtures of aluminum and nickel nanopowders obtained by electric explosion of wires were studied. It was detected that the main products of synthesis are nanofiber crystals of intermetallides Al_3Ni_2 and Al_3Ni.

UDC 621.785:669.14.08.29

Solonenko O.P., Golovin A.A., Ovcharenko V.E.
NUMERICAL ANALYSIS OF INFLUENCE OF MODES OF PULSE ELECTRON-BEAM RADIATION ON THE PROCESS OF THERMAL TREATMENT OF CERMET PLASMA COATING

Physico-mathematical model has been proposed, bundled software has been developed and detailed numerical investigation of processes at pulse electron-beam treatment of coatings of various thickness of cermet alloy TiC-(Ni-Cr) has been carried out in wide range of power densities, action time and pulse repetition frequency. The results of the work may be of interest for understanding processes occurring at surface treatment of coatings and materials by high-concentrated energy fluxes.

UDC 536.46:519.6

Sorokova S.N., Knyazeva A.G.
COUPLED MODEL OF SINTERING POWDERS OF THE SYSTEM Ti-$TiAl_3$

The mathematical model of sintering powders of Ti-$TiAl_3$ at homogeneous controlled heating has been proposed and studied. It is taken into account that chemical transformations occur with volume changed and accompanied by appearance of mechanical stresses and deformations in addition to stresses and deformations owing to temperature high gradients. It is taken into consideration that volumetric changes influence thermal and chemical processes. Evolution of temperature, concentrations of elements and compounds, relative change of sample volume and volumetric deformations in time were studied.

UDC 661.847.2+669.57

Skorynin G.M., Kononov D.B., Morozov O.A., Dikarev D.A., Timofeev D.V., Guzeeva T.I.
BURNING TEMPERATURE INFLUENCE ON DENSITY OF TABLETS OF ZINC OXIDE DEPLETED BY ISOTOPE ^{64}Zn

Burning temperature influence on density, strength and moisture absorption of tablets of zinc dioxide depleted by ^{64}Zn, used in nuclear

reactor cooling systems has been studied. It was stated that tablet density increases in the range of 800...1300 °C in 1,2...1,45 times and decreases at further temperature rise. Tablet strength in the given interval is almost constant. Optimal conditions for thermal treatment of tablets of zinc oxide were determined.

UDC 621.039.586:536.42

Vasiliev Yu.S., Suprunov V.I., Irkimbekov R.A., Shamanin I.V., Lyzko V.A.
SIMULATION OF TEMPERATURE FIELD DYNAMICS AND CARBIDE FORMATION IN EXPERIMENTS WITH CORIUM

The results obtained in instrument and numerical experiments on determining the dynamics of thermal state and carbide formation at use of physical model of fuel element melting process at serious overdesign accident of nuclear reactor have been described. Constants of equations of kinetics of graphite-zircon-uranium dioxide interaction at temperatures to 3200 K were determined. The developed technique allows simulating the dynamics of temperature fields, material melting and carbide formation at induction heating of active zone material composition.

UDC 621.972

Glazov A.N.
STUDYING TEMPERATURE FIELD OF AIR-OPERATED HAMMER. P. 3. SURFACE TEMPERATURE FIELD

Diagrams of temperature distribution on body generator have been constructed by the results of experimental investigations for certain time moments at cutting steel band and plate, cast-iron plates. The example of temperature field pattern of M-6 hummer surface is given. Hummer thermal state was analyzed on the basis of the obtained material.

UDC 621.972

Glazov A.N.
STUDYING TEMPERATURE FIELD OF AIR-OPERATED HUMMER. P. 4 INFLUENCE OF COMPRESSED AIR TEMPERATURE

The dependences of temperature time change in characteristic points of body surface have been obtained and temperature distribution along hummer for different temperature of compressed air has been shown. The example of temperature field pattern of M-6 hummer surface is given. It is shown that exhaust air temperature depends directly on compressed air temperature. Surface temperature field was studied and temperatures dependences of M-5, M-6 and KE-22 dashes on compresses air temperature were obtained. There is information and recommendations for hygienic estimation and organization of work processes.

UDC 548.31;538.915

Zhuravlev Yu.N., Lisitzyn V.M., Fedorov I.A.
DEFORMATION INFLUENCE ON ELECTRON STRUCTURE OF SILVER AZIDE

Influence of crystal lattice deformation on band structure, state density and distribution of silver azide electron density has been studied by the methods of density function theory in local density approximation and generalized gradient approximation of exchange-correlation potentials in basis of atomic orbital linear combination with the help of the package CRYSTAL06. It was stated that volumetric hydrostatic and uniaxial compression results in decrease of interatomic distances, forbidden band width, anion and cation charge and thereby, promotes reactions of solid-phase decomposition. It was shown that lattice deformation may result in formation of linear molecules of silver and azide atoms.

UDC 538.97-405;53.082.5

Lisitsyn V.M., Lisitsyna L.A., Zdorovtsev M.V., Dauletbekova A.K., Akilbekova A.T.
ESTIMATION OF TRACK RADIUS OF HEAVY CHARGED PARTICLES IN IONIC CRYSTALS BY INDUCED ABSORPTION SPECTRA

New approach to estimation of track radius of heavy charged particle by the results of studying the ratio of induced simple and complex color centers in ionic crystals by ion and electron flows from powerful high-current accelerator has been described. Radius of track accelerated to 117 MeV of ion 84Kr in crystal LiF was estimated. The obtained track value corresponds well to the known one from estimations by other methods.

UDC 539.21

Tyurin Yu.I., Shigalugov S.Kh., Emeliyanov V.N., Kataev A.N., Malovichko Yu.V., Plotnikova E.Yu.
SOLID BODY SURFACE LUMINESCENCE INITIATED BY PREADSORBED OXYGEN ATOMS

The results of studying luminescence excited at puffing molecular gases O_2, N_2O and CO to the surface of crystal phosphor Zn_2SiO_4:Mn, filled up preliminary with oxygen atoms are given. This phenomenon is interpreted in the model of acceleration of surface heterogeneous recombination of oxygen atoms in the formed adsorption layer of oxygen-containing molecules O_2, N_2O, CO by exchange-associative mechanism.

UDC 539.21

Tyurin Yu.I., Shigalugov S.Kh., Emeliyanov V.N., Kataev A.N., Malovichko Yu.V., Plotnikova E.Yu.
SOLID BODY SURFACE LUMINESCENCE INITIATED BY PREADSORBED MOLECULAR PARTICLES

Heterogeneous luminescence excited at puffing the flow of molecular oxygen-containing particles to luminophors of Zn_2SiO_4:Mn and Y_2O_3:Bi^{3+}, surfaces of which are preliminary filled up with molecules of carbon, oxygen or nitrogen oxide has been studied. Velocities and sections of recombination processes were determined $N_2O+CO\text{-}L \rightarrow CO_2\text{-}L+N_2$ ($\sigma=5\cdot10^{-22}$ cm^2, 400 K); $O_2+CO\text{-}L \rightarrow CO_3\text{-}L$ ($\sigma=2\cdot10^{-22}$ cm^2, 400 K); $CO+O_2\text{-}L \rightarrow CO_3\text{-}L$ ($\sigma=2\cdot10^{-22}$ cm^2, 550 K); $CO+N_2O\text{-}L \rightarrow CO_2\text{-}L+N_2$ ($\sigma=7\cdot10^{-22}$ cm^2, 550 K) on samples Zn_2SiO_4:Mn, Y_2O_3:Bi.

UDC 519.24:538.91:53.01

Tyurin Yu.I., Chistyakova N.V.
SIMULATION OF ATOM DIFFUSION IN CRYSTAL LATTICE BY MONTE-CARLO METHOD

The algorithm for simulation particle diffusions in crystal lattice has been developed on the basis of Monte-Carlo method and random walk. Ratios for connection of model parameters and coefficients in diffusion equation were proposed. Simulation for problem of diffusion with different boundary conditions was carried out.

UDC 535.34:535.37:535-3

Lipatov E.I., Avdeev S.M., Tarasenko V.F., Sosnin E.A., Novoselov Yu.N.
IDENTIFICATION OF DIAMOND WITH ITS SIMULATOR BY KrCl EXCILAMP

Spectra of optical transmission and luminescence of samples of corundum and diamond of natural and artificial origin as well as fianite have been measured and studied. Luminescence was excited and optical transmission of samples in the range of 200...300 nm was measured by KrCl-excilamp of barrier discharge with spectral maximum of 222 nm. KrCl-excilamp was suggested to be used for developing devices of nondestructive identification of diamond and its simulators.

UDC 620.171

Chugreev S.A., Gerasimov S.I.
CONTROLLING STABILITY OF FORM OF OPTICAL DATA CARRIERS AT WORKING OPERATIONS

The experimental-calculated analysis of stressed state in optical data carriers occurring at spraying reflecting layer has been carried out. Correlation of the character of interference bands and working production operations was determined.

UDC 621.3.083.2

Lapatin L.G., Yurchenko A.V., Novikov A.N.

STUDYING THE INFLUENCE OF INHOMOGENEITY OF CHARACTERISTICS OF SILICON ORIGINAL MATERIAL ON PARAMETERS OF PHOTOELECTRIC SOLAR CELLS

Techniques and devices for contactless local measurement of electrophysical parameters of Si have been proposed. Inhomogeneity of specific resistance, lifetime of nonequilibrium charge carriers and conductivity slime by silicon plate width which was later used for making photoelectric solar cells were studied with their help. The results of influence of inhomogeneous distribution of electrophysical parameters in photoelectric solar cells substrate on its efficiency are given.

UDC 535.215.12

Karimov B.Kh.

PHOTOVOLTAIC AND PHOTOREFRECTORY EFFECTS IN PIEZOELECTRIC CRYSTALS

Photovoltaic and photorefrectory effects in piezoelectric crystals of ZnS have been examined. Some experimental and physical bases of photovoltaic effect in piezoelectric crystals of ZnS were discussed. Photovoltaic coefficients k_{ik} for ZnS were determined. This coefficients $K^{4} \approx 5 \cdot 10^{-9}$ A·cm·(W)$^{-1}$ for ZnS. Coefficients k_{ik} exceed proper coefficients in $LiNbO_3$:Fe in more than order. The possibility of using photopiezoelectrics in holographic recording was shown.

UDC 537.226.4:004.8

Slyadnikov E.E.

ELEMENTS OF THE THEORY OF FERROELECTRIC PROPERTIES OF CYTOSKELETON MICROTUBULE

Physical model of configurational degrees of freedom of cytoskeleton microtubule as a system of interacting dipoles has been stated and studied. It was shown that presence of frustrated bands is the most important feature of disordered dipole system of cytoskeleton microtubule. Phase diagram of ferroelectric state of cytoskeleton microtubule at 0 K was constructed. It was shown that the principle state of dipole system of cytoskeleton microtubule is a dipole skeleton or weak ferromagnetic. Root-mean-square dipole moment and correlation length of microtubule dipole chain were calculated.

UDC 621.01

Zhukov I.A.

LIFE DEVOTED TO THE SCIENCE

The biography of professor Leonid Trofimovich Dvornikov - the honorary graduating student of the Tomsk polytechnic institute, Honored Scientist of Russia and Kyrgyzstan, the head of department of the theory of mechanisms and machines and design principles of Siberian state industrial university, doctor of technical science, is given.