Summaries

UDC 621.52+511.52

Simonyan S.O.
DETERMINATION OF SQUARE PARAMETRIC GENERALIZED INVERSE MOORE–PENROSE MATRICES APPLYING DIFFERENTIAL TRANSFORMATIONS OF PUKHOV

The author has proposed rather simple numerical analytical technique for determining square parametric generalized inverse Moore–Penrose matrices. The known test task is considered.

UDC 519.6

Shumilov B.M., Esharov E.A., Kuduev A.Zh., Ymanov Y.S.
QUINTIC MULTI–WAVELET

The authors have proposed two new types of multi-wavelets on the basis of quintic Hermitian splines. The algorithm of wavelet decomposition was obtained. The article introduces the results of the numerical experiments.

UDC 514.757.2

Ivlev E.T., Al–Khassani M.A., Luchinin A.A.
DIFFERENTIABLE MAPPING OF AFFINE Q_m AND PROJECTIVE P_n SPACES ($m<n$)

It is proved that affine space mapping into manifolds of degenerate and non degenerate null-pairs of projective space are determined in invariant way by affine and projective spaces mapping.

UDC 517.988.8

Korytov I.V.
FUNCTION REPRESENTING ERROR FUNCTIONAL OF A CUBATURE FORMULA IN SOBOLEV SPACE

Representation of error functional of a cubature formula is set up for an arbitrary function from Sobolev space normalized while using the derivatives of all orders up to the highest one. In comparison with the papers devoted to the issue of setting up the functional representations by the summable functions the Sobolev space here is normalized without pseudodifferential operator. The existence, uniqueness and summability of the representing function are proved. Neither norm nor representation of the functional coincides with those described before at any value of the highest order of the function derivatives in the class considered.

UDC 519.87

Monakhova E.A.
ON CONSTRUCTION OF MULTIDIMENSIONAL CIRCULANT GRAPHS OF DIAMETER TWO

The paper considers the task of optimization of undirected circulant networks consisting in maximizing a number of nodes at predetermined graph degree and diameter. New lower bounds of a number of nodes for circulant networks of any degrees and diameter two were obtained. For the first time the infinite families of circulants of diameter two achieving the obtained bounds were constructed.

UDC 514.757.2

Al–Khassani M.A., Moldovanova E.A.
DIFFERENTIABLE MAPPING OF AFFINE Q_n AND PROJECTIVE P_n SPACES

The authors have studies the fields of invariant geometric images occurring when mapping affine space into projective space. Using these geometric images it is shown that the affine space mappings into manifolds of degenerate and non degenerate null-pairs of projective space occur in invariant way with the mapping considered.

UDC 517

Churikov V.A.
DIFFERENTIATION POLYNOMIALS IN LOCAL FRACTIONAL ANALYSIS BASED ON d–OPERATOR

It is shown that in local fractional analysis there are rather simple integrable fractional-order functions, a certain order base primitive of which equals zero.

UDC 519.25 (550.831.05)

Ustinova I.G., Pakhomova E.G.
ESTIMATION OF AUTOCORRELATION FUNCTION IN THE FORM OF EXPONENT LINEAR COMBINATION

The paper considers approximation of autocorrelation function in the form of exponent liner combination. The possibility of such approximation has been shown by the example of exponential and exponential-cosine autocorrelation functions.

UDC 517

Churikov V.A.
THE GENERALIZED G–OPERATOR OF COMPLEX ORDERS OF REAL VARIABLE

The author introduces the local differentiation and integration G-operator of a complex order real variable which is the generalization of d-operator of real orders in the case of infinite number of local operators for which the conformity principle is fulfilled. The paper considers its several properties and special cases.

UDC 531.01.

Rodionov A.I.
COVARIANT FORMS OF PRINCIPLES AND EQUATIONS OF MOTION IN THE SYSTEMS WITH DIFFERENTIAL CONSTRAINTS

The paper introduces the author's idea of the system of differential variation principles and equations of mechanics in the systems with arbitrary differential constraints. It is based on the classical mechanics extension variant which describes the dynamics of any orders holonomic and nonholonomic systems. For the constrained system its Affix is introduced. It moves in E_{3N} space on the multifold R_m, restrained by the differential constraints as well. Based on the motion equations the author introduces the covariant forms of mechanics equations and principles of highest order nonholonomic systems.

UDC 621.762.4.04.016.2

Dvilis E.S., Chartpuk P., Khasanov O.L., Sokolov V.M., Eshetov B.A.
ANALYTIC AND MODEL OPTIMIZATION OF KINEMATIC DIAGRAMS FOR POWDER MATERIAL UNIFORM–DENSE COMPACTION

The article introduces the comparative model and analytic description of helical implementation of collector method for compacting powder material developed and licensed at Tomsk polytechnic university. The collector method principle is based on density autoalignment throughout the compact by multidirectional movement of mold forming surfaces. Within the principle the authors have pro-

posed the kinematic diagram of sealing cylindrical compacts in the collector mold with spiral slides spun around compaction axis at a certain optimum angle. The authors have proposed the analytic tools for initial analytic study of the compaction diagram efficiency. Powder compaction in different ways was modeled by the finite element method. The results of the comparative simulation showed that statistical variability of deformation local values in compacts made by collector method with spiral slides decreases to 48 % in comparison with common static compaction and to 5 % in comparison with the original version of the collector method. Thus, the collector method with spiral slides allows decreasing additionally density gradients and may be used for manufacturing ceramics of nanopowders which are characterized by pronounced negative effect of wall-adjacent friction at their compaction in closed rigid molts.

UDC 62−531.7

Gavrilin A.N., Korovin G.I., Rozhkov P.S.
DYNAMICS OF CUTTING STRUCTURAL STEELS WITH END-MILLING CUTTERS

The article is devoted to optimization of structural steel milling modes when using special vibration-proof tool of the original construction.

UDC 621.822.6.001

Efremenkov E.A., Sorokova S.N., Kobza E.E.
THE PECULIARITIES OF DESIGNING DOUBLE−POLE DRIVE WITH THE INTERMEDIATE ROLLING ELEMENTS

The paper considers the peculiarities of designing a drive with the intermediate rolling elements and free iron ring with two pitch points. The details of the direct design, by the original parameters of the drive, and the design based on the prescribed center to center distance is shown.

UDC 535.36

Goryachev B.V., Mogilnitsky S.B.
THE RESEARCH OF LAYERED DISPERSION MEDIA REFLECTANCE

The authors have considered the radiation transfer in triple dispersion media with reflective surface. The analytic expressions for determining the values of reflectance and transmission coefficient of dispersion media consisting of three plane layers limited by the reflective surface were obtained. It was shown that stratosphere and bottom atmospheric layers even at low value of optical density and its weak change impact considerably the reflectance of the system «triple media−reflective surface» at all magnitudes of substrate reflection coefficient. It was ascertained that the increase of elongation degree of scattering radiation indicatrix in a cloud layer results in reflectance decrease of the whole dispersion media; this effect is similar to reduction of optical density of atmosphere cloud layer.

UDC 543.544.72

Zhdaneev O.V.
CHROMATOGRAPHIC SYSTEM WITH RADIAL GEOMETRY

The paper describes the principle of chromatographic system with radial geometry. The proposed version of chromatographic column allows simplifying the manufacture in comparison with the traditional samples of the variable geometry columns and applying stationary phase layer under control.

UDC 544.452.14

Medvedev V.V., Ilyin A.P., Reshetov A.A.
THE EFFECT OF ALUMINUM OXIDE ON THRESHOLDS OF LASER IGNITION OF ALUMINUM NANOPOWDER AND IRON OXIDE MIXTURE

The paper introduces the results of experimental researches on pyrotechnic composition (aluminum nanopowder+iron oxide) ignition by laser radiation (λ=1,06 μm) with pulse duration 3,5 ms. The authors have measured energy thresholds of laser ignition of the investigated composition and the composition with aluminum oxide admixtures at different press in densities. Phase composition of end combustion products was studied. It was ascertained that the admixtures of aluminum oxide nanopowder into iron-aluminum termite reduce energy ignition thresholds when increasing sample density.

UDC 669.141.32:620.192.7

Apasov A.M., Apasov A.A., Kozlov E.V.
DESTRUCTION OF NITROCARBONIZED STEEL

The it authors have studied the structure of steel subjected to carbonitriding and subsequent heat treatment to determine the reasons of its destruction. The mechanism of hear cracks initiation was defined and their evolution trajectories were determined.

UDC 621.791.92

Gnyusov S.F., Ignatov A.A., Durakov V.G.
THE FEATURES OF WEAR OF STEEL P6M5−BASED COMPOSITION COATING IN TRIBOCONTACT WITH STEEL ShKh15 IN A WIDE RANGE OF VELOCITIES AND LOADS

The paper introduces the results of investigation of friction surface structure and tribotechnical characteristics of steel P6M5-based composition coatings after friction with a steel disc in the range of slip velocities from 1,2 to 3,6 m/s and loads from 20 to 100 N. The authors have determined two extremely gross wear areas and two areas of steady-state wear in the friction pair steel P6M5−steel ShKh15. For friction pair «steel P6M5+20 wt. % WC»−steel ShKh15 the authors have determined the considerable reduction of composition coating wear rate (2−3 times) in comparison with the steel P6M5-based coating. The wear rate of composition coating grows linearly with the load; it is connected with oxidative wear development.

UDC 669:621.7

Khokhlov V.A., Potekaev A.I., Galsanov S.V.
STUDY OF STRESS RELAXATION IN THERMOMECHANICAL TITANIUM NICKELIDE−BASED JUNCTIONS AND METHODS FOR THEIR RELIABILITY GROWTH

The stress temporal changes were obtained due to the study of girth strength and energy dissipation in pipe thermomechanical junctions by nickelide titanium ferrule. The methods for their reliability growth were developed.

UDC 669:539.612

Potekaev A.I., Khokhlov V.A., Galsanov S.V., Shulepov I.A.
ENERGY DISSIPATION AND ADHESIVE PROPERTIES OF QUAZI-HERTZ CONTACT OF SHAPE MEMORY MATERIALS

Energy dissipation in material contact determined by the hysteresis loop parameters was related to the adhesive interaction on physical contact areas at its cyclic compression. The features of forming loops in discrete contact of titanium nickelide bodies were mentioned.

UDC 538.911

Klopotov V.D., Potekaev A.I., Klopotov A.A., Kulagina V.V., Knestyapin E.A., Markova T.N., Morozov M.M.
TRIPLE TITANIUM ALUMINIDE−BASED DIAGRAMS. ANALYSIS AND CONSTRUCTION

Based on ordering the condition diagrams Ti-Al-Me (Me=V, Cr, Mn, Fe, Co, Ni, Cu) the authors have determined the reduction of homogeneity areas sizes in firm solution on the basis of β-Ti among the alloying elements V→Cr→Mn→Fe→Co→Ni→Cu with the growth of a number of intermetallic compounds inside the isothermal triangle. It is revealed that almost all «internal» compounds possess a cubic or hexagonal syngony.

UDC 544.452

Ilyin A.P., Mostovshchikov A.V.
CRYSTAL AIR COMBUSTION PRODUCTS OF ALUMINUM NANOPOWDERS UNDER MAGNETIC FIELD ACTION

The authors have studied the microstructure of microcrystal air combustion products of aluminum nanopowder and the effect of mag-

netic field on their structure. It has been ascertained that two level filamentary crystals are the combustion products of loose aluminum nanopowders. At air combustion the hexagonal form monocrystals are formed in uniform magnetic field and the prolate form edged crystals of micron size are formed in the case of inhomogeneous magnetic field. The formation of stretched-out structure products can be explained by mass transfer of combustion products towards heat flows. The ordered hexagonal crystal structures are probably formed due to the oxidation products overheating under magnetic field action and the increase of mobility of their structural units in thermal wave of crystallization. According to the electron microscopy the formation of the edge crystals is possible at optimal size of combustion products particles.

UDC 621.762.3

Skorentsev A.L., Rusin N.M., Kolubaev E.A.
THE INFLUENCE OF EQUAL CHANNEL ANGULAR PRESSING ON STRUCTURE AND PROPERTIES OF ANTIFRICTION ALLOY Al–40Sn

The authors have studied the influence of equal channel angular pressing on structure and properties of sintered alloy Al-40Sn. It was ascertained that the layer structure is formed in the alloy due to deformation processing; the phase layer thickness decreases when increasing pressing number. Besides the strengthening of Hall−Petch the alloy strength grows additionally due to interphase layer thinning. It was revealed that processing with the equal channel angular pressing method reduces the wear rate of the investigated alloy and influences slightly its friction coefficient value at dry friction.

UDC 621.791

Poletika I.M., Krylova T.A., Tetyutskaya M.V., Makarov S.A.
FORMATION OF WEAR–RESISTANCE COATINGS BY OFF–VACUUM ELECTRON–BEAM TUNGSTEN CARBIDE SURFACING AND FURTHER HEAT TREATMENT

Hardened coatings of low wear resistance were obtained by surfacing tungsten carbide powder on low-carbon steel at accelerator ELV-6. To increase wear resistance the authors have carried out the experiments on thermal treatment influence on structure and features of the coatings surfaced with tungsten carbide.

UDC 539.4

Barannikova S.A., Shlyakhova G.V., Zuev L.B., Maltsev Yu.A.
THE STUDY OF FINE STRUCTURE OF CABLE ELEMENTS IN ENGINEERING NB-TI ALLOY–BASED SUPERCONDUCTORS AT MULTISTAGE COLD DRAWING

Applying the methods of atomic force, electron and optical microscopy the authors have studied the structure evolution at an intermediate stage of cold drawing at $\varnothing 1,3 \rightarrow \varnothing 1,2$ mm transition of superconducting Nb+47 % Ti alloy-based cable; the latter is used in magnetic system of the International Thermonuclear Experimental Reactor. The aim of the research is to analyze the influence of cold drawing deformation on the structure of multifilamentary Nb-Ti alloy-based superconductor. The authors have studied the microstructure, phase composition and their influence on properties of superconducting alloy Nb-Ti after cold drawing and intermediate annealing. The areas of plastic strain localization in spots of superconductor breaks were found out. The change of form and chemical composition of Nb-Ti fibers was detected in a defect-free region and in cable break zone. The authors determined the diffusion Nb barrier around Nb-Ti fibers in copper matrix. The laws identified should be taken into account when developing the cold drawing deformation technique to obtain the superconducting cores of the desired size.

UDC 621.372.413

Artemenko S.N., Igumnov V.S.
POWER AMPLIFICATION OF RESONANCE MICROWAVE COMPRESSOR WITH ENERGY OUTPUT BY OSCILLATION MODE TRANSFORMATION

The paper introduces the results of estimations of principle characteristics of the resonance microwave compressor with energy output by oscillation mode transformation on coupling window of a reso-nator with closed waveguide stub. The authors have considered the problem of providing weak coupling of the resonator with the load in energy storage mode. The power and amplification of microwave compressor output pulses were estimated. It was shown that pulse power amplification in the compressor investigated may be comparable to the amplification in the compressor with energy output through the *H*-tee-based interference switch. The waveguide stubs with coupling windows area comparable to the resonator section area are required to be applied in microwave compressor with oscillation mode transformation to achieve the amplification which is comparable to wave amplification in a storage resonator.

UDC 621.382

Vintizenko I.I.
MODIFICATION OF THE RELATIVISTIC MAGNETRON ELEMENTS

The paper introduces the results of the experimental investigations of relativistic microwave magnetrons aimed to increase the efficiency and stability of the generated microwave pulses. The main elements of the magnetron: anode block, microwave output, antenna system and cathode unit have been modernized for these purposes.

UDC 537.533.9

Koval T.V., Le Khu Zung
THE RESEARCH OF THE INFLUENCE OF FERROMAGNETIC INSERT ON DENSITY DISTRIBUTION OF LOW–POWER ELECTRON BEAM

The paper considers transportation of low-power high-current charge compensated electron beam in axially symmetric magnetic field and in non-symmetrical magnetic field of a reverse current distributor with ferromagnetic inserts arranged behind the collector. The influence of geometrical dimensions and properties of the material of cylindrical inserts (solid and hollow) on beam density distribution on the collector was numerically studied. It was shown that electron beam density section and target distribution may be controlled by ferromagnetic inserts.

UDC 537.333

Grigoriev V.P., Zvigintsev I.L., Kuznetsov P.E.
«SNAKE» INSTABILITY OF CHARGE COMPENSATED NONUNIFORM ELECTRON BEAM

The large-scale lateral instability of charge partially compensated electron beam conditioned by resonance of coupled transverse oscillations of electron flow and ion channel is studied. The instability increments have been determined depending on wave length. It was shown that the instability is controlled on nonlinear stage due to lateral perturbation strength dependence on beam shift from equilibrium path.

UDC 621.039.51

Kuzmin A.V.
ON CALCULATION OF NEUTRON AGE IN GRAPHITE

The authors have compared the results of calculation of fission neutron age by the experimental data of carbon neutronic characteristics in different manuals. The paper introduces solution algorithms for slowing-down neutrons age. The comparison of calculation results at fission neutron slowing-down to indium resonance energy by the group method showed good convergence with theoretical and experimental data.

UDC 534.2:539

Belomestnykh V.N., Soboleva E.G.
POISSON'S RATIOS OF ALKALI–HALIDE CRYSTALS. P. II. SODIUM HALOGENIDES

The Poisson's ratios of sodium halogenide crystals under reference conditions and at temperature change have been studied. It was ascertained that at temperature rise in crystals NaX (X=F, Cl, Br, I) the type of inequation between anisotropic Poisson's ratio $\sigma_{(hkl)}$ in certain points of their elastic isotropy changes.

UDC 622.692.4.05

Bogdanov E.P., Rikkonen S.V.
HYDROMECHANICAL RESISTANCE MOMENT
OF CONTROL SHUTTER IN MAIN OIL PIPELINE

The authors have proposed the formal geometrical method of approximate hydromechanical calculations of a control butterfly shutter in main oil pipelines. The method allows computing pressure drops, resistance moments on a drive shaft and determining power losses in the shutter.

UDC 622.692.4.053: 621. 646.001.5

Bogdanov E.P., Rikkonen S.V.
CALCULATION OF HYDROMECHANICAL FEATURES
OF A PIPE VALVE OF THE MAIN PIPELINE

The technique for calculating pressure and power losses in the pipeline element (wedge valve) considering liquid flow under and over a wedge gate has been developed. The technique allows determining power losses for transmission of different density and viscosity liquid at different ratio of pipeline length and armature elements amount. It allows developing as well the mathematical algorithm to control the pipe valve considering power losses and so minimizing to a certain degree the losses.

UDC 535:621.373.826

Smagulov A.A., Lapin I.N., Svetlichny V.A.
THE DEVELOPMENT OF THE AUTOMATED INSTALLATION
TO SYNTHESIZE NANOPARTICLES OF NOBLE METALS
BY THE METHOD OF LASER ABLATION
OF VOLUME TARGETS IN LIQUID

The authors have developed the automated installation to obtain nanoparticles of noble metals by the method of laser ablation of volume targets in liquid. The installation contains the system of target displacement for its uniform irradiation and the original licensed flow system with control of nanoparticle concentration in solution by optical transmission and with feedback. The installation with fundamental harmonic pumped Nd: YAG pulse laser allows synthesizing continuously colloid solutions of Ag, Au and Pt nanoparticles in the range of concentrations 0,01…0,1 g/l with high frequency.

UDC 53.088.228+004.942

Filippov M.M., Babushkin Yu.V., Gribenyukov A.I.
ESTIMATION OF TEMPERATURE SENSOR EFFECT ON
TEMPERATURE FIELD OF RING HEATING MODULE

The computation experiments on investigation of temperature sensor effect on temperature field of ring heating module of multipoint heat-treatment installation have been carried out. The results of calculation show that the temperature sensors effect considerably the temperature distribution in heating module and its energy consumption.

UDC 519.63

Zimin V.P.
STUDYING THE FEATURES OF PLASMA BOUNDARY
CONDITIONS IN COLLECTOR OF THERMIONIC DIODE

The author has analyzed the model of monotone plasma boundary conditions in collector of thermionic diode on planes plasma density–ion current, plasma density–energy density of electrons and the others. The typical behavior of boundary conditions curves was classified; the features of their change including the ignition area of arc mode were studied.

UDC 621.384.64:539.12.04

Mashchenko A.I.
FREQUENCY LINEAR INDUCTION ACCELERATOR WITH TWO
BIPOLAR PULSES

The paper introduces the electric circuit of frequency linear induction accelerator with magnetic commutation which forms on a load a sequence of two bipolar pulses separated from each other by time gap. The author proposes the technique for calculating the circuit elements and the results of calculation of output pulse parameters of the accelerator when modeling its active load operation. The obtained design values of the output pulses demonstrate the possibility in principle of such accelerator application for example in processes in the field of material science.

UDC 621.039.58: 532.529.5

Vityuk V.A., Vurim A.D., Shamamin I.V., Kozlovsky S.B.
THERMOPHYSICAL METHOD FOR DETERMINING ENERGY
PARAMETERS OF MODEL FUEL ASSEMBLIES IN IMPULSE
TESTS ON PULSED URANIUM–GRAPHITE REACTOR

The paper introduces the computational-experimental technique for controlling energy release in fuel assemblies at their testing in central experimental channel of pulse research reactor. The results of the technique approbation in the course of the test sequence with the experimental device are introduced. The device is intended for studying the behavior of model fuel assemblies of the reactor unit of VVER-1000 type under conditions modeling the final accident stage with loss of coolant.

UDC 536.2:536.33

Morozova E.Yu., Lisitsyn V.M., Tsipilev V.P., Yakovlev A.N.
LASER DAMAGE ON DOUBLE–LAYER SYSTEM INTERFACE

The paper considers the issue of pulse laser heating of double-layer system in which the first layer is transparent relative to the actuating flow and the second is a highly lossy one. Temperature profiles of heating double-layer system at different lengths of actuating pulse have been obtained by the numerical simulation technique. It was shown that heating maximum position does not conform to medium interface. The results obtained were used when analyzing the process of laser separation of gallium nitride crystal from sapphire substrate.

UDC 535.211

Aksenov V.P., Kanev F.Yu., Kuksenok D.S.,
Makenova N.A., Khapaeva A.V.
RECORDING THE VORTEX BEAM PARAMETERS
IN TURBULENT ATMOSPHERE.
P. I. THE USE OF WAVE FRONT GRADIENTS

Based on the methods of the numerical experiments the authors study the possibility of determining the characteristics of vortex radiation expanding in turbulent medium. To obtain the estimation results given in the first part of the paper the parameters are determined using gradients of phase distribution of light field; the ideal optical system is considered.

UDC 535.211

Aksenov V.P., Kanev F.Yu., Kuksenok D.S.,
Makenova N.A., Khapaeva A.V.
RECORDING THE VORTEX BEAM PARAMETERS
IN TURBULENT ATMOSPHERE. P. 2. CONSIDERATION
OF WAVE FRONT SENSOR RESTRICTIONS

In the second part of the paper the Hartmann sensor model is introduced into design diagram; it allows determining its influence on optical system operation accuracy and optimizing the device parameters. In the closing paragraph the accuracy of detecting the optical vortex in turbulent medium using the sensor is compared with the accuracy of the results of the ideal optical system operation.

UDC 536.253

Gvozdyakov D.V., Gubin V.E.
MATHEMATICAL MODELING OF SULPHUROUS ANHYDRIDE
CONDENSATION IN ATMOSPHERE ADJOINING THERMAL
ELECTRIC STATION

The paper introduces the results of numerical estimation of intensity of sulphurous anhydride condensation in air adjoining thermal electric station. The authors have determined the size of cores of acid drops which can fall on the Earth surface at sedimentation.

UDC 532.529.2

Glukhov A.F., Demin V.A.
SEDIMENTATION OF PARTICLES IN FERROCOLLOIDS
CONSIDERING DYNAMIC BOUNDARY CONDITIONS

The authors have carried out the numerical investigation of particle sedimentation in kerosene-based ferrofluid in a thin vertical channel considering probable thermodiffusion particle redistribution at nonuniform heating. The values of thermodiffusion parameter have been determined. Thermal diffusion at such parameters for specified temperature difference on channel edges is comparable to sedimentation segregation mechanism.

UDC 538.911, 539.32

Zubko I.Yu., Simonov M.V.
ENERGY METHOD TO CALCULATE ELASTIC MODULES
OF FINITE SIZE SAMPLES WITH HCP–LATTICE

The elastic modules of the finite size samples with hexagonal close-packed lattice have been calculated on the basis of theoretical research algorithm for elastic properties of metal micro- and nano-monocrystals with cubic lattice developed before [1, 2]. The sample form is matched with the lattice symmetry [3]. The power potential Mie is selected as a potential. The approach of atomic statics is used to research the elastic properties. The type of deformation gradient is prescribed and crystal current configuration is determined. To calculate the elastic modules in crystal current configuration the total potential energy of the sample taken relative to its volume is determined. The elastic modules of the sample are determined equating the square terms in its power series expansion by deformation parameters to elastic potential. It was shown that hexagonal close-packed lattice consisting of two simple sublattices cannot be deformed uniformly at preset affine kinematics. Relative shift of sublattices depending on deformation parameters should be predetermined to support the minimum of potential energy of hexagonal close-packed crystal in current configuration. It was ascertained that the elastic modules of hexagonal close-packed crystal depend on the sample size. This dependence has horizontal asymptote conforming to macroscopic monocrystal body with known elastic properties; it allows identifying the parameters of atom interaction potential. All the computations have been carried out in symbolic form in Wolfram Research «Mathematica».

UDC 536.46

Volkov R.S., Kuznetsov G.V., Strizhak P.A.
SOME PHYSICAL LAWS OF SPRAYED
WATER EVAPORATION WHEN MOVING THROUGH
HIGH–TEMPERATURE COMBUSTION PRODUCTS

Macroscopic laws of sprayed hydraulic fluids (fresh water and water with salt admixture) evaporation when moving through the fixed height flame has been studied by the experiment using high-speed measuring system. The integral parameters of drop evaporation (size, mass, concentration) were determined. The authors found out the conditions of spraying the test hydraulic fluids ensuring the completeness of their evaporation.