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SUMMARY

PHYSICAL AND MATHEMATICAL SCIENCE

I. I. Gonchar, M. V. Chushniakova, S. A. Gelver
Fusion of complex nuclei: double folding potential and problem of abnormally large diffuseness

We have work out a model using it we have made some progress in the problem of apparently large diffuseness of the nucleus-nucleus interaction potential. The diffuseness of the Woods-Saxon shape potential must be extremely large to fit a largemo number of precision capture excitation functions. In our model the friction force is supposed to be proportional to the squared derivative of the potential. The model is calculated within the framework of the double folding model with the density-dependent M3Y NN-forces. We have obtained satisfactory agreement of the calculated

excitation functions with the data despite the double-folding potential is known to possess rather small diffuseness.

Keywords: the large diffuseness, the double folding potential, fusion of complex nuclei.

V. N. Zadorozhnyi
Main task of fractal queueing theory

A main task of fractal queueing theory is offered. Solving methods of the theory are discussed.

Keywords: queueing systems, simulation, analytical-simulation modeling.

V. I. Potapov

Development of mathematical model and algorithm of optimal control of movable structure — adjustable redundant system controlled by information channel

A mathematical model has been built and algorithm of optimal control is developed enclosing in conflict situation of movable control over channel reserved system intensity of component failure of which depends on time and space point where this system transfers.

Keywords: mathematical model, algorithm, movable system, conflict situation.

V. D. Belitskii, A. V. Katunin

Thesaurus of mathematical models of asphalt and concrete mix compaction process

The thesaurus of mathematical models of asphalt and concrete mix compaction process is provided. It is shown that providing a relaxation of the mix in the course of its consolidation gives the chance to obtain pavement quality and the smallest power consumption of mix compaction process. It is also considered the algorithm and condition of rational movement speed realization of road skating rink during compaction that allows developing algorithm of technological indicator definition of asphalt mix compaction process, answering to the condition of minimization of energy consumption.

Keywords: mathematical model, compaction process, asphalt concrete mix, relaxation period.

L. V. Belgart

About dichotomy of decisions of the linear systems of the second degree with almost periodic coefficients

For the class of the dynamic linear systems the sufficient sign of exponential dichotomy in terms of coefficients is obtained.

Keywords: exponential dichotomy, Lyapunov's direct method, indefinite Hermite form.

P. A. Batrakov, A. V. Maer, V. A. Shaptsev

The transform algorithm of the structural model of a complex system in parallel-sequential

For the analysis and research of complex systems it is important to have a description of their structure (structural function). The structure of complex systems is often in disorder. Such a structure will lead to the structure of a type «k» out of «n». In the present work we consider a transform algorithm of the structural model of a complex system in parallel-sequential structure. Unchecked structure is described with the help of the graph (directed or undirected). For the implementation of any of the algorithmic language proposed pseudo-code algorithm. One of the options for the application of the algorithm can be the objectives of the evaluation of reliability of complex systems.

Keywords: complex system, structure, parallel-sequential structural model, transform algorithm, graph, structural function.

I. A. Tikhonov

Evolution of the linear lightning in the course of the electrical discharge

The lightning structure in the course of the electric discharge is considered. The nature of distribution of the charged particles in the channel of a lightning on the basis of the obtained experimental data is established.

Keywords: lightning, spark, streamer, spiral

E. A. Tkachenko, D. V. Postnikov

Calculation of stresses under irradiation of metal alloys

For explanation of the reasons for the grid cracks formation on the surface of the structural steel samples coated during the low-energy irradiation of high-current beams of electrons and ions, the model calculations of the temperature and thermoelastic stresses is carried out. The calculations show that during the irradiation to the surface of the structural steel (Cr — 6 %) by pulsed electron beam with the kinetic energy of 500 keV, the current density of

0.8 kA/cm² and a pulse time more than 150 ns there are stressed which exceed tensile strength of the material. There may be the reason for explanation for the destruction. Also it is established that the stresses on the sample surface perpendicular to the flow of electrons exceeds the stresses along the depth of the sample in 2-3 times. The main contribution for the grid cracks formation in the surface layer make transverse stresses.

Keywords: high-current electron beams, temperature fields, thermoelastic stress, simulation.

M. V. Chushniakova, I. I. Gonchar, T. A. Aronova

Capture cross-sections and diffuseness of the nuclear matter distribution in symmetric reaction 30Si+30Si

An effort is undertaken to use the excitation function of the 30Si+30Si capture reaction as the source of information about the diffuseness of the nuclear matter distribution. For this aim the capture cross sections are calculated using the DISTODIVE model. The heavy-ion collision process is described by the stochastic dynamical equations accounting for the dissipation, thermal fluctuations, and memory effects. The friction force is considered to depend quadratic upon the nuclear part of the ion-ion potential. This part of the potential is calculated by means of the double-folding model. The M3Y NN-forces with the nuclear matter density dependence and the finite range exchange term are used. It turns out that the excitation function is sensitive to both the diffuseness of the matter distribution and the dynamics of the process. The values of the parameters providing the $\chi^2 < 3$ agreement with the data do not contradict to those obtained earlier for different reactions.

Keywords: heavy-ion fusion, capture cross-sections, the double-folding model.

CHEMICAL SCIENCE

I. A. Kirovskaia, E. V. Mironova

Neutralization oxides carbon (II) on catalysts of semiconductor system InSb-CdTe

Straight (no gradient flowing and circulation flowing) and also indirect (Furye-IR-spectroscopy) methods within the range of temperatures 290 – 390 K study catalytic properties of binary and multicomponent semiconductors of system InSb-CdTe in reaction of a hydrolyze of carbon oxides (II).

On the basis of cumulative consideration of results of the executed catalytic and IR-spectroscopy research taking into account early the received data on adsorption and catalytic properties of diamond like semiconductors the mechanism of the studied reaction is obtained. Catalysts are revealed in (CdTe, (InSb)_{0,05} (CdTe)_{0,95}) that show activity at ambient air temperature and capable to act as neutralization catalysts CO (carbon monoxide).

Keywords: diamond like semiconductors, solid solutions, catalysts, extent of transformation, IR-spectroscopy research, reaction mechanism.

L. V. Belskaia, I. V. Muromtsev, A. P. Solonenko

Investigation of organic acids role in mineral formation in the prototype of human saliva

The effect of carboxylic acids (pyruvic, citric and acetic) on the composition of the mineral phase, crystallizing in the prototype of oral fluid average healthy adult human is investigated using methods of X-ray diffraction, IR-spectroscopy and optical microscopy. It is found that organic substances can inhibit pathological mineralization in the oral cavity and prevent dental calculus formation and growth.

Keywords: prototype of oral fluid, organic acids, dental and salivary stones, crystallization.

T. A. Didenko, O. A. Verevkina

Synthesis and research of chemically modified silica gel with the implanted amino groups

Surface modification of silica gel brand KSKG by monoethanolamine in order to make the surface of the basic properties is carried out. The degree of modification of the sorbent under the chosen conditions is 2.0 % mass. The characteristics of the modified silica gel: $S_{\text{specific}} = 200 \text{ m}^2 \text{ g}^{-1}$, the amount of grafted amino groups of 3.2 to 1 nm² surface. Set of acid-base properties of the sorbent

surface and the possibility of its application for the determination of metal ions in aqueous medium are established.

Keywords: silica gel, silanol groups, monoethanolamine, chemical modification, amides

T. A. Didenko, O. A. Verevkina, L.N. Adeeva
The oxidized carbon-mineral sorbent for extraction of copper (II) ions from water solutions

Oxidation of a surface of the carbon-mineral material received by carbonization of spropel is carried out by solutions of nitric acid and hydrogen peroxide. It is established that oxidation leads to formation of mainly carboxyl groups on a surface. It is shown that on a surface the sample processed of 30 % by solution of hydrogen peroxide has the greatest concentration of oxygen-containing functional groups. For the oxidized sorbent consistent patterns of sorption of ions of copper (II) of model water solutions are determined. Comparison of sorption capacity of the oxidized sorbent and initial carbon-mineral material is carried out.

Keywords: oxidation, carbon-mineral material, sorption, carboxyl groups, copper (II) ions.

S. O. Podgornyi, O. T. Timoshenko, E. D. Skutin, I. V. Mozgovoi
Adsorption properties of components of the InSb-CdTe system. Size effects

Adsorption of carbon monoxide (II) on powders and nanofilms of solid solutions of the ZnSe-CdTe system is studied. The principles of adsorption are established in dependence on the conditions, of the size effects and of the habitus of an experimental sample. The most active adsorbents (with respect to CO) is recommended for further use as materials of primary transducers in sensors for environmental purposes.

Keywords: semiconductors, nanofilms, adsorption, sensors.

O. A. Fediaeva, M. V. Vasina, E. G. Posheliuzhnaia
Electronic microscopy study of the system of ZnTe-CdSe

Results of the microscopic, dispersive and element analysis of the synthesized solid solutions $(\text{ZnTe})_X(\text{CdSe})_{1-X}$ are presented. In the field of compositions 26 – 68 mol. % of ZnTe is observed transition of sferelite modification to the hexagonal. Correlation in change of sizes of a specific geometrical surface of grains and a hydrogen indicator of a point of a zero charge is noted.

Keywords: solid solutions, crystal structure, geometrical surface, acidity of a surface.

E. A. Sarf, L. V. Belskaia, I. V. Muromtsev, A. P. Solonenko
The effect of supplementation of urea on the processes of human dental calculus formation

The experimental simulation of main mineral phase's formation from saliva-like solutions was made. During simulations the composition of the solid phases precipitating from solutions with different contents of calcium, magnesium, phosphate, chloride, sodium and potassium ions at 37 °C has been determined. The qualitative variation of solid phase composition above all depends from $(\text{NH}_2)_2\text{CO}$ concentration in solutions.

Keywords: modeling, prototype of oral fluid, urea, dental calculus, crystallization.

MECHANICAL AND THEORETICAL ENGINEERING

E. V. Artamonov, D. V. Vasil'ev
The relationship between operability and type of cutting elements and chips

This paper presents the results of research based change of chips during machining of materials by cutting from cutting temperature as a determining factor in all relationships of phenomena in metal cutting.

Keywords: performance, cutting, chip formation, cutting conditions, the cutting temperature.

E. V. Artamonov, V. V. Kireev
The stress-strain state of interchangeable inserts a hob

This paper presents the results of investigation of the stress-strain state of the tooth worm gear milling cutters during the simulation by using the software Kompas-3D and ANSYS.

Keywords: Hobbing, the tool, firm alloy.

Iu. A. Bur'ian, S. N. Poliakov, Iu. P. Komarov
Rubber-cord pneumatic-hydraulic support with inertial motion converter

In the article the principle of construction and mathematical model of a low-frequency vibration-isolated support, which in one form factor installed in parallel to the rubber-cord pneumatic dumper and hydraulic inertial motion converter based on rubber-cord shell filled with fluid are considered.

In the work it is shown that coordination of characteristics of a pneumatic support and the inertial hydraulic motion converter can be highly effective low-frequency vibration isolators for putting up power units in various industries.

Keywords: vibration isolation, rubber-cord shell, shock absorber, motion converter, hydraulic support.

V. S. Kalekin, D. V. Kalekin, A. N. Nefedchenko
Mathematical model of piston pneumatic engine with self-acting valves

There is mathematical model workflow of piston pneumatic engine with self-acting valves taking into account the dynamics of the mechanism of movement, and the results of experimental and theoretical studies are obtained. Recommendations for improvement of structures of pneumatic piston engines of a new type are given.

Keywords: piston pneumatic engine, normally open self-acting valve, mathematical model of the process, the dynamics of the mechanism of movement.

S. V. Korneev, R. V. Buravkin, I. I. Shirlin, N. S. Lavrienko, A. A. Ivannikov
Choice of transmission oils for application in conditions of subzero temperatures

The technique of a choice of transmission oil taking into account the influence of viscous and temperature characteristics on energy efficiency of units of transmission is developed at equipment operation in the conditions of subzero temperatures. Recommendations about practical application of results of research are submitted.

Keywords: low temperatures, transmission oils, effective use of energy.

V. I. Kuznetsov
Workflow turbojet engine without mixing flows

Work is about of equalization for close loop of mathematical model of working process of dual flow turbojet engine without mixing of first and second loops flow. It is shown the reserved mathematical model allows to expect descriptions of the turbojet engine without application of adjusting laws at limitation on durability and heat-tolerance.

Keywords: mathematical model, workflow, specifying, equation turbojet engine.

E. V. Artamonov, D. S. Vasilega, A. M. Tveriakov
Determination of maximum performance carbide tools

The paper presents a method and apparatus for determining the temperature of maximum efficiency of replaceable cutting inserts of hard metal tools.

Keywords: performance, instrumental hard alloy cutting plate, carbide cutting plate, modes of cutting.

A. L. Akhtulov, A. V. Leonova, L. N. Akhtulova
Technique of estimation of quality of processes of designing of complex technical devices

Methods of an estimation of quality of processes of designing of complex technical devices are considered, at the account of

the basic parameters of quality for the proved choice of the most comprehensible variant from among competing. Ways of an estimation of influence of separate design stages of a technical product are described, and methods of definition of accuracy of the complex technical products entering into the chosen parameter are offered.

Keywords: complex technical device, object and process of designing, the design documentation, estimations of quality.

D. Iu. Belan, A. O. Otradnova
Spark erosion with positioning of the electrodes relative to the surface of the collector electric machine

In this article the analysis of existing methods of processing of materials is done. To improve the durability of the collector plates electrical machine of direct current is proposed to use the electro erosive method namely electrosark doping as its basis.

Keywords: collector-brushunit, electro spark doping, hardening, positioning, wear resistance

O. V. Kropotin
Predicting the reliability and lifetime the seal using simulation

On the example of the combined seal is considered application of the method of predicting the reliability and lifetime seals using simulation.

Keywords: reliability, lifetime, seals, simulation.

O. V. Kropotin, Iu. K. Mashkov, O. A. Kurguzova, S. V. Shilko
Optimization of seal design using the parameter of space investigation method

Procedure of seal geometry optimization by criteria of contact interaction has been described.

Keywords: optimization, seal, contact interaction.

S.V. Melnik, G. A. Goloshchapov, V. V. Evstifeev, N. V. Kalinin
Investigation of the influence of lubricants for wear of track roller bearing in excavator EO-5126

The effectiveness of the use of single shovel excavators carrying about 40 % of the excavation works in construction is considered due to mainly technical condition of the major systems. A large proportion of downtime is due to the need to eliminate failures joints rollers. The penetration of dirt and water into the friction joints causes abrasive wear of rubbing surfaces of the parts. It is known that top-up rollers liquid lubricant does not stop the abrasive wear of the friction surfaces, and only leads to excessive consumption of lubricant. The results of long term tests on the friction machine MI-1M and operating it possible to study the wear patterns of axles and bushings, rollers and hinges make a conclusion about the effectiveness of the modified lubrication Litol-24.

Keywords: plastic lubricants, wear pairs of sliding friction, modifiers test.

A. V. Cherniakov, V. S. Koval, A. V. Sukhov, K. V. Pavliuchenko
Research of a process of grain lots sorting on a conic separator on various cultures

The article is devoted to research of the process of grain lots sorting by a conic separator on various cultures. The dependences of the qualitative characteristic of conic separator-completeness of division are received. They revealed the rational constructive and regime parameters of conic separator.

Keywords: conical separator, process of sorting, various cultures.

N. N. Chigrik
Study of influencing of fit, component functional tolerance, on longevity and fidelity of assembly of fixed linkings of parts of cylinder-piston group of the automobile motor engine ZMZ-511.10. Part 1

In the view of influencing design and operation fit, component functional tolerance, the limiting values of functional negative allowances in fixed linkings of parts of cylinder-piston group of the automobile motor engine ZMZ-511.10 in conformity with

implementation of conditions of supply of fidelity and best longevity of joints with a negative allowance are established, and also, that the tolerance of the shape confines deflection of the shape of substantial surfaces by consideration of definitions of the limiting sizes of an opening and arbor, data GOST 26346-89 from the stand of maximal and minimum of material, and the deflections of the shape, restricted field of tolerance of the size, moderate a field of tolerance of the true sizes by tolerance parameter of the shape and by means of waist of tolerance of the shape it is possible to expand a field of tolerance of the size at the installation between tolerance of the shape and tolerance of the size of a rational proportion under GOST 24643-81.

Keywords: interference fit, tolerance of fit, inaccuracy, deflection of the shape of surfaces, fidelity.

N. N. Chigrik
Study of influencing of deflections of the shape of mating surfaces of parts of cylinder-piston group of the automobile motor engine ZMZ-511.10 at their selective assembly on fidelity of element sizes

By consideration of definitions of the limiting (marginal) sizes of an opening and arbor, data GOST 25346-89 from the stand of limit of maximal and minimum of a material, allowing, that the tolerance of the element size confines deflection of the shape of his surfaces, at measuring and grading on dimensional groups of interfaced parts of cylinder-piston group of the automobile motor engine ZMZ-511.10 of deflection of the shape of substantial surfaces of the element sizes, restricted field of tolerance of the shape, moderate the field of tolerance of the true sizes by tolerance parameter of the shape. It is detected to expand the field of tolerance of the size it is possible by means of waist of tolerance of the shape at the installation between tolerance of the shape and tolerance of the size of rational proportion till the GOST 24643-81 and introducing of manufacturing tolerance (Т_{изп}), the value which one is less than tabulated tolerance on value of a probability excess of the size for limits off the field of tolerance (c) for abnormally adopted parts applicable to deflection of the shape of substantial surfaces of linkings, at offset inside of a field of tolerance of an article (Т_{изд}) concerning values of limiting deflections of the element sizes.

Keywords: method of batch transposability, deflection of the shape of surfaces, fit, tolerance of fit, tolerance of the shape of a cylindrical surface, inaccuracy.

A. P. Shevchenko, M. A. Begunov
Theoretical study of traction resistance keeled ploughshare

Calculation traction resistance of a keeled ploughshare and the analysis of forces operating on it is considered. Dependences of traction resistance of a ploughshare on design and technological data are presented.

Keywords: traction resistance, keeled ploughshare.

A. P. Shevchenko, A. N. Lukin
Pneumatic scarifier for treatment of perennial leguminous grasses seeds

The given device and the principle of a pneumatic scarifier for seed treatment of perennial legumes are studied. Investigations of the influence of the degree of weight loss on sowing seed quality: germination, amount of solid and crushed seeds in the stock, as well comparative trials of experimental scarifier is done.

Keywords: scarifier, air flow, spiral, sediment chamber, the degree of loss mass seeds, seed quality.

I. I. Shirlin, A. V. Kolunin, S. A. Gelfer, A. A. Ivannikov, V. V. Nechaev, A. D. Gedz, N. A. Kuznetsov.
Oil lifetime — as factor depending on conditions of operation of vehicles

A vehicle operating conditions determine the activity of oxidative processes in engine oils and additives processes triggering inputs in their production. In the Omsk region there have been widely used domestically produced cars «GAZelle». Cargo and passenger transport, ambulance, police and many other areas of Omsk and villages include the use of the family car. This article presents the results of tests of motor oil grade SAE 10W-40 and production-class API SL / CF engine used in the 4-car groups «Gazelle» worked in various operating conditions, as well as substantiate these results.

Keywords: oil resource, acid number, base number, oxidative processes, engine speed, propane-butane mixture.

Iu. F. Galuza

Mathematical model of a vibration-isolating support with the active hydraulic inertial transformer

The mathematical model of the active vibration-isolating support consisting of parallelly connected rubber-metal shock-absorber and the hydraulic inertial transformer of movement with the active control on the basis of the rubber-cord jacket is considered.

Keywords: hydraulic converter slow motion, rubber-shell, active control, force coefficient

M. V. Kucherenko, M. A. Gudun

Calculation of artificial construction thermal stability

It is provided the calculation of artificial construction thermal stability. Basic data are presented by two series: for the frozen and thawing periods. It is shown that soil bases of lower height have a greater value of thermal stability coefficient.

Keywords: frozen soil, thermal stability, artificial constructions.

D. I. Lepeshkin, A. L. Ivanov

Experimental studies of processes in fuel equipment of diesel engine

The peculiarities of investigation of fuel equipment are presented. The methods of undertaking the test are described by experimental installation for study of processes in fuel equipment of high pressure, as well as accounting dependencies and estimation of inaccuracy of measurements when undertaking the experiment. There are considered results called on experimental studies of the study of the processes in fuel equipment of high pressure staff and equipped by the set of experimental plunger.

Keywords: experimental studies, fuel equipment of the diesel.

A. N. Orlov, D. N. Algazin

Analysis of working body for processing of inter-row space corn

Results of theoretical study of the dump crest maker cultivating dumping type are given. The analysis of forces operating on working body is carried out. Expression for definition of a rate of weight flow of the soil moved by working body, and its traction resistance is obtained. Rational ranges of values of parameters of a crest maker are determined.

Keywords: crest maker, crest, lancet paw, working body, the mass per second rate, specific volume.

A. A. Portnova

The relationship between the front steering wheels turning angle and the articulated frame turning angle of the motor grader

This paper presents the results of research of the articulated motor grader, the relationships between the front steering wheels turning angle and the articulated frame turning angle are detected for front steering wheels and back wheels move on the same track, and the dependence of motor grader turning radius on the front steering wheels turning angle is detected.

Keywords: articulated motor grader, experimental researches, turning angles.

M. M. Saenko, A. L. Ivanov

Experimental studies of the functioning the diesel equipped with test fuel equipment

The study of fuel equipment is described as experimental installation and stand for testing the diesel. The methods for testing unrolled stand with full-size diesel KAMAZ-740 are presented as well as accounting dependencies and estimation of inaccuracy of the measurements when undertaking the experiment on the unrolled diesel. There are considered results called on experimental studies of the functioning the full-size engine KAMAZ-740 equipped with set of the test fuel equipment.

Keywords: experimental studies, fuel equipment of the diesel.

A. V. Bubnov, M.V. Gokova, V.N. Goriunov, V. A. Emashov, A. N. Chudinov

Improving the quality of regulation synchronous cophase electric drive based on indirect methods of measuring of angular acceleration and error adjustment of the angular velocity

The article suggests methods for indirect measuring of angular acceleration and error adjustment of the angular velocity.

Keywords: synchronous cophase electric drive, logical comparator, indirect measurement of angular speed, indirect measurement of angular acceleration, phasing, synchronization.

V. R. Vedruchenko, N. V. Zhdanov, E. S. Lazarev

Designing of optimal cylindrical tanks for oil products used in industrial boiler plants and other fuel consumers

Design features of reservoirs and storage containers for liquid oil products from petrol to crude oil, using as engine fuel, industrial boiler fuel, on tank farms and storage facilities is considered.

It is expedient to construct and build the optimal size for reduction of operational expenses, cost of materials and manufacturing of tanks and containers.

Optimal cylindrical tanks for oil products and other liquid fuels design method using the method of Lagrange multipliers are proposed.

Keywords: oil storage tank, optimal size, operational safety, method of Lagrange multipliers, minimal surface.

V. N. Goriunov, A. M. Paramonov

On the question of energy saving in air-supply systems of industrial plants

The analysis of the results of energy audits air supply systems of industrial enterprises is done. There are proposed methods of energy saving in systems production and distribution of compressed air, as well as improving the efficiency and reliability of the air supply system.

Keywords: compressed air, air supply system, energy saving, compressor, efficiency.

V. I. Karagusov, Iu. A. Bur'ian

Experimental study of gas cryogenic Stirling machine with rare-earth regenerator

There is considered experimental investigation of the application of rare-earth regenerator in Stirling cooler. The application of such regenerator allows to increase its thermodynamic characteristics, such as efficiency and cooling capacity. Experiments have shown a considerable decrease in the minimum cooling temperature.

Keywords: gas cryogenic Stirling machine, regenerator, rare-earth metals.

V. L. Iusha, I. P. Aistov, G. I. Chernov, M. I. Katrina

Theoretical analysis of the efficiency of compressor and power unit on the basis of screw machine

In this paper the mathematical model of the processes occurring in the screw internal combustion engine of mobile compressor unit is considered. The parametric analysis of the expansion engine is made on the basis of this mathematical model.

Keywords: mathematical model, internal combustion engine, screw machine.

V. I. Karagusov, V. D. Galdin

Orbital cryogenic cooling system photodetecting devices

To an orbital spacecraft there is increased requirements on the time of active existence, power, weight and dimensions characteristics. Thermoacoustic cooling systems have a long service life, high reliability. For its work, such systems can use the thermal energy instead of electricity. Application of heat and cold accumulators enables the cooling system on the sunny and shady sections of the orbit.

Keywords: spacecraft, cooling system, thermoacoustic, photo-detecting device.

V. K. Fedorov, P. V. Rysev, D. V. Rysev, I. V. Fedorov, V. V. Fedianin, L. G. Polyntsev, A. I. Zabudskii
Entropy and energy spectral density of random processes as equivalent measure of uncertainty and their generalization to chaotic processes

A complex electronic system with positive feedback for the experimental verification of the principle of sustainable imbalance in the nonequilibrium energy, electric and electronic systems is designed. The modes of the complex electronic system operation including modes of deterministic chaos and modes of a chaotic self-oscillations synchronization as a factor of self-organization are studied.

Keywords: positive feedback, chaos, randomness, self-organization, entropy, energy spectral density.

R. N. Khamitov, G. S. Averianov, A. A. Perchun
The electromechanical elements in vibroshock protection of large-size objects

Designs of vibroshock protection devices with an electromechanical damper with big travels for large-size objects are offered. Results of dynamics are given at free fluctuations, advantage of the double-thread vibroshock protection device is shown.

Keywords: active system of damping, electromechanical damper, pneumoshock-absorber, coefficient of absorption of energy.

V. V. Kharlamov, V. N. Goriunov, P. K. Shkodun, A. V. Dolgova
Improvement of diagnosis technology of commutator brush unit for rolling stock traction motors

This article is devoted to diagnosis of commutator-brush unit for traction motor TL-2K1. Current repair engineering procedures are analyzed and new repair engineering procedures of traction motor including new diagnosis procedures is proposed.

Keywords: diagnosis, commutator-brush unit, engineering procedure, repair, traction motor.

K. V. Khatsevskii, Iu. N. Dementev, A. D. Umurzakova
Model of asynchronous electric motor for measuring mechanical coordinates

A simulation model is presented for the control of motor three-phase asynchronous motor coordinates. The model takes into account when measuring the temperature of the winding conductors coordinate the stator and stator voltage harmonic frequency. Characteristics of mechanical coordinate's simulation of the asynchronous motor are provided to assess the accuracy of the mechanical coordinate's measurement in the dynamic modes.

Keywords: asynchronous electric motor, angular speed of rotation, torque measurement

V. L. Iusha, A. P. Bolshtianskii, G. I. Chernov, E. V. Marchenko, M. F. Gorai
Mathematical model of expansion engine workflows for heat recovery systems of compressor units

In this paper the mathematical model of the processes occurring in the expansion screw machine heat recovery system of mobile compressor unit is considered. Parametric analysis of the expansion engine is made on the basis of this mathematical model.

Keywords: mathematical model, expansion machine, compressor unit.

K. V. Khatsevskii, A. A. Shagarov, D. A. Shagarov
Modeling of impact on the supply network installation with two adjustable electric drives

The article carries out research of the influence of transients in electric drive on feeding network methods of mathematical modeling in the software package MATLAB. There is received waveform currents and voltages on the elements of the schemes, diagrams spectral content of the line current.

Keywords: asynchronous electric motors, semiconductor frequency converters, motor, mains, phase current, phase voltage.

S. G. Shantarenko, V. M. Luzin, A. F. Maslov
The influence of electromagnetic factors on traction electric motor operation

The article is resulted in the qualitative analysis of the impact of eddy currents massive additional poles and massive body structure on operation of the traction electric motor with the use of the offered mathematical models of electromagnetic processes. As a control parameter characterizing the eddy currents induced in all the active elements of the magnetic extension pole the time constant of the process of attenuation of the signal flow is taken. It uniquely identifies the disorder of switching the work of the traction electric motor in dynamic modes.

Keywords: traction electric motor, magnetic core, eddy current, switching, time constant process of attenuation.

V. L. Iusha, S. S. Busarov, A. A. Gurov, A. N. Kabakov, V. K. Vasil'ev
On definition of heat flow in mathematical simulation of operational processes with non-traditional volumetric compressor flow diagram

The article raises the problem of choice of the method of calculation of heat transfer processes in compressor technology. Justification of choice of the method of calculation of heat transfer coefficient and the prospects for further experimental investigation of heat and mass is given.

Keywords: reciprocating compressor, mathematical modeling, heat transfer.

S. S. Busarov, Iu. K. Mashkov, A. V. Nedovenchanyi, N. Iu. Fedoseeva
The study of heat transfer processes in the long-stroke, low-speed compressors for the effects of the valve is located

The article raised the problem of calculating the asymmetry of the temperature field along the cylinder diameter due to different heat transfer conditions for suction and discharge valves.

Keywords: piston compressor, mathematical simulation, heat transfer

D. V. Pashkov, A. V. Aleksandrov
Improving accuracy measuring system of electrical energy on buses of traction substation JSC «Russian railways»

The introduction of automated information-measuring systems for commercial accounting of electricity at high voltage buses of traction substations of JSC «Russian Railways» requires significant expenditures. One of important tasks is to evaluate the revenue side of this investment project. One component of the technical and economic benefits of automated information-measuring systems for commercial accounting of electricity is to increase the accuracy of measuring complex.

Keywords: electrical power, commercial metering, transmission, improved accuracy

E. M. Rezanov, A. P. Starikov, S. V. Glukhov, M. S. Sherstobitov
Improvement of heat consumption systems power inspection technique in state organization buildings

The technique of heat consumption systems power inspection in buildings has been improved. The building specific heat power indicator algorithm defining heat and power indicators as well as heat saving potential has been developed.

Application of this development will promote economical effective choice of thermal energy saving procedures in heat consumption systems in state organization buildings.

Keywords: energy saving, thermal energy, heat transfer, heat consumption, potential, inspection.

A. N. Alpysova, A. V. Bubnov, A. M. Dainovich, O. P. Dainovich
Definition of application area of digital research methods in phase locking motor drives

This article is about features of the influence of different types of modulations on phase locking motor drive. The problems taking place during designing and analysis of precision motor drive systems are defined in this article. The computer simulation is

made by the authors to solve these problems. After performed research the authors make a conclusion about using methods of digital systems theory in phase locking motor drive.

Keywords: phase locking motor drive, digital systems, pulse-width modulation.

INSTRUMENT ENGINEERING, METROLOGY AND
INFORMATION MEASURING EQUIPMENT AND SYSTEMS

V. Iu. Kobenko

Determination of range of identification scale of distribution forms

The range of identification scale measuring forms of probability distribution is determined. Already available marks are predetermined and new marks of an identification scale are added.

Keywords: range, identification, form measurement, classification, distribution, signal, tester, scale

A. A. Kuznetsov, V. A. Sleperev, A. V. Peleznev

Implementation of mobile devices calibration curves for spectral analysis of materials using virtual standards

This article contains information about how to stabilize the calibration curves to external and internal factors in the spectral analysis of materials. Analytical expressions that reduce the bias of changing the position of graphs, significantly increasing the time between the holding position correction calibration curves for recalibration standard samples. A mathematical model of virtual standards for the calibration dependence realization is created.

Keywords: calibration curve, influencing factors, spectral analysis of materials, virtual standards.

INFORMATION TECHNOLOGY

E. A. Altman, E. I. Zakharenko

High-performance method for improving visual quality of object image in video sequence

The proposed method improves the visual quality of the video object by using the full search motion estimation algorithm and averaging brightness of the estimated images of the object in successive frames. High performance of the proposed method is achieved through efficient calculation of the function. It corresponds to images of an object of motion estimation algorithm and gives the integration of this method in the video systems and analyzes video content in real time.

Keywords: motion estimation, comparison function, full search algorithm, video, noise reduction, video compression.

A. S. Gumeniuk, I. A. Volchkova

Use of formal model of character sequence order for translation quality evaluation

In this work some limitations of existing translation quality numerical evaluation methods are noted. As hypotheses two groups of characteristics are presented. Estimates of the first kind are based on display of statistical word distribution of the linguistic work, and second kind, except noted, use relative position of word in original text and its translation with use of chain order analysis formal means. As the result of computer analysis are obtained quality characteristics values of two kinds for sets of books on three languages (Russian, English, German). There is performed comparison of proposed features. The paper presents a part of the values of numerical characteristics of the sample. An attempt is made to evaluate the quality of translations in general, on the set of books.

Keywords: text order, rank distribution of words, chain depth of homogeneous chain, distribution variance, normal variance, translation quality.

I. P. Melnikov, V. G. Shakhov

Use of FPGA for confidential communication

Questions of the use of FPGA for confidential communication are considered. There are analyzed disadvantages of foreign component base. There are marked advantages of FPGA to application in household, industrial and military equipment.

Keywords: FPGA, ASIC, algorithms of digital processing of signals, radio-electronic equipment.

E. E. Shmulenkova

The analysis of the functional possibilities of CAD for making drawings of machining tools

In the article there are considered toolbox and technologies available in CAD for making drawings of machining tools. The categorization CAD is given on degree of automations of the design solutions.

Keywords: computer-aided design system, machining tooling design, parametric modeling.

RADIO ENGINEERING AND COMMUNICATION

Iu. N. Klikushin, V. Iu. Kobenko

Method of transmission of messages in directly chaotic communication systems

A new method of data transfer in communication systems with chaotic carrier is proposed. The method is based on the principle of controlling the shape of the distribution of the carrier signal. The characteristics of the noise are investigated and the conditions that ensure the correct reception of messages with a probability of less than 0.92 were identified.

Keywords: demodulation and modulation, noise immunity, the method of demodulation, communication systems, control the distribution, chaotic carrier

A. D. Bialik, V. A. Gridchin, M. A. Chebanov

Features of the fiber optic pressure sensors designing

In this paper question of amplitude fiber optic pressure sensors designing are described. Transforming characteristics and influence of the design parameters for it are studied.

Keywords: fiber optic sensors, pressure, transforming function.

A. V. Zubar, V. A. Maistrenko, K. V. Kaikov

Hardware-software implementation of optical-electronic stereo system for determination of distance

The approach of measurement of distance to object is considered on the basis of the information of two video cameras which are settling down on known distance from each other, viziers axes which are parallel. Paper reads about the way of the defining the range by means of stereoscopic electro-rangefinder, where the procedure and results of defining the range summing error. Experimental data are resulted.

Keywords: ranging, stereoscopic method, procedure of defining the range summing error, image, kamera calibration.

A. N. Lepetaev

Technology to minimize noise crystal oscillators on the basis of numerical and analytical modeling

The noise of crystal oscillator is an important parameter affecting the quality of the device. The article discusses the technology of crystal Kolpitts oscillator noise analysis, it allows optimization of the noise properties under condition of constant power dissipation in a quartz resonator.

Keywords: crystal oscillator, Kolpitts circuit, computer simulations of crystal oscillators, noise of crystal oscillator, power dissipation in quartz resonator, oscillator noise minimization.

G. N. Lobova, M. E. Osinkina

Use of SADT-methodology for testing of printing knots

In the given article the modern approach to the problem of testing printed-circuit boards is considered. Features of designing of printed-circuit boards and possibility of their manufacture are analyzed, the methods to their check which are based on principles of SADT-methodology are used.

Keywords: the printed-circuit board, SADT-methodology, thermal calculation, Ems, topology, components.

I. A. Batyrev, G. V. Svistunov
LDPC-decoder in the channel decoding system of digital media broadcasting receiver for the RAVIS standard

The work is devoted to basic methods of decoding LDPC codes, which can find application in the channel decoding system of digital multimedia signal receiver for the RAVIS standard. Simulation results presented for some code parameters are defined by the standard.

Keywords: RAVIS, LDPC, decoding methods.

O. Iu. Matiushkova, V. Iu. Tetter
Modern methods of vibroacoustic diagnostics

This article gives an overview of the main methods for vibration monitoring units of railway rolling stock. The directions of further development of vibro-acoustic method of control are given.

Keywords: vibration diagnostics, temporal signal, spectral analysis

G. S. Nikonova, A. V. Martynov
The study of frequency characteristics of SAW devices

The article contains design algorithm developed SAW oscillators. The simulation of the SAW oscillator circuits, the results of some experiments are presented.

Keywords: SAW filters, SAW delay lines, SAW oscillators.

CHEMICAL TECHNOLOGY. CHEMICAL INDUSTRY

E. O. Karpova, I. Iu. Nagibina
The technology of semiconductor photocatalysis-environmentally friendly way of using solar energy

About hydrogen energy they dream for a long time: the specific heat of combustion of hydrogen is three times higher than that of oil or gasoline, the combustion of hydrogen is water vapor; resources of raw materials for the production of hydrogen are endless. That is the nature of the semiconductor materials are now widely used in the processes associated with photocatalysis.

By the method that is developed first including physical and chemical properties of the original binary compounds CdS, ZnTe investigated photocatalytic properties of binary compounds and solid solutions $(\text{CdS})_x(\text{ZnTe})_{1-x}$ in water decomposition reaction. Practical recommendations are given for their use, the scheme creates a model unit for production of hydrogen from water.

Keywords: hydrogen, photocatalysis, catalysis, semiconductors, solid solutions.

E. A. Strizhak, G. I. Razdiakonova, E. A. Maratkanova, Iu. A. Bur'ian, L. V. Adiaeva, N. V. Avreitsevich, N. S. Mitriaeva
The role of polarities of rubber in shaping hysteresis characteristic of the rubber in condition of harmonic dynamic tension

A comparison of the dynamic properties of rubber obtained by the standard recipe with rubbers of different polarity — polar nitrile BNKS-28AN and nonpolar butyl BK1675 is carried out. The temperature dependence of E' of the dynamic modulus of elasticity of rubber and mechanical loss tangent $\text{tg } \delta$ rubbers in the «strain —

tension» with the help of dynamic mechanical analyzer DMA 242D at different frequencies and the «master curve» are obtained. These data can be helpful in developing formulations of rubber mixtures with polymers.

Keywords: rubber, dynamic characteristic, carbon black, polymer, dynamic mechanical analysis.

PUBLISHING. POLYGRAPHY

A. V. Golunov, L. G. Varepo
The expansion of the gamut colors printing systems

The article is devoted to the investigation of the influence of the parameters of printed material, the number of colors playable in the conditions of modern systems of multi-colored printing. Recommendations are given on the methodology for the selection of printed material to match the color of the scope of the original and opportunities color printing system. The analytical expression of the dependence of the volume of the body color coverage and quantitative parameters characterizing the properties of the surface of printed material are obtained.

Keywords: color reproduction, print system, color gamut.

I. A. Sysuev, A. Iu. Zakharov
Special features of making up scientific magazines (on the example of journal «Omsk scientific bulletin»)

The problems related to the modern technologies of the production of such specific products of printing industry as printed publications especially journals are regarded in the article. Their peculiarity is considered to be in preprinting preparation which is made with the help of the author electronic version of the article, that causes the necessity of their typographic editing alongside with the process of page-proofs itself. The groups of difficulty of typographic editing and creating charts and formula are set, complexity of technological processes of preprinting preparation is found, the comparative analysis of complexity calculations of print-proofs and existed norms is made. Standard time for creating scientific magazines on the basis of the necessity of typographic editing of author materials taking into account their group of difficulty is set.

Keywords: scientific publications, preprinting preparation, print-proofs, typographic editing, groups of difficulty of typographic editing and print-proofs, standard time.

I. A. Sysuev, P. A. Zuev
Research of color reproduction in systems of digital printing

The questions related to the possibilities of color reproduction in such systems of digital printing as laser printers, realizing the technology of the color electrography are considered in the article. The color coverage of the systems of color electrography and possibilities of color reproduction from different applied programs are analyzed. Recommendations for the optimization of the color reproduction are given.

Keywords: digital printing, color electrography, color laser printers, color coverage, color reproduction, optimization of the color reproduction.

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