

Table of Contents

Preface and Committees

Chapter 1: Mechanical Engineering, Processing and Surface Engineering, Metals Treatment, Equipment and Tools

On the Need to Increase Pressure and Flow Rate SCTE in the Grinding Zone V. Yashkov	3
Analysis of Force Dependences of Diamond Burnishing with Different Types of Burnishing Tools Y.B. Chervach, V.A. Mezentssev, N.E. Galin and A.B. Kim	8
Modal Analysis as a Means of Researching the Vibrations in Grinding D.V. Ardashev	15
Research on Fracture Mechanics and Dispersed Structure of the Polymeric Composite Materials under Abrasive Processing A.A. Dyakonov and I.V. Shmidt	19
Electric Drill Drive with Intermediate Rolling Members Reducer V. Korotkov and S.V. Razumov	24
Force Analysis of Double Pitch Point Cycloid Drive with Intermediate Rolling Elements and Free Retainer E.A. Efremenkov, E.E. Kobza and S.K. Efremenkova	29
Research Methods of Milling Technology Elements A. Gavrilin, B. Moyzes and A.I. Cherkasov	35
Geometric Model of the Interaction of the Grinding Wheel and Workpiece during Surface Grinding with the Periphery of a Straight Wheel A.A. Dyakonov and L.V. Shipulin	41
Prospects for Further Rock Cutting Mechanisms Development M.B. Novoseltseva and E.N. Pashkov	47
Technical Diagnosis of Internal Combustion Engines in the Parameters of Vibration A.P. Syrbakov and M.A. Korchuganova	53
The Effect of Electrolytic Hydrogenation on the Plastic Flow of Aluminum Alloy A.V. Bochkareva, A. Lunev, S.A. Barannikova and L.B. Zuev	59
Study of Methods Relating to Increase of Contact Pitting Resistance in 45, 40H, 35HGSA Steel due to Development of Heterogeneous Structure Involving Mechanical Hardening Technique A. Kirichek and S.V. Barinov	65
Development of Bases and Evaluation Capabilities of the New Tribotechnology for Plain Bearings V.V. Zelinsky and D.N. Suchilin	70
Development of Parameters Describing Heterogeneous Hardened Structure A. Kirichek and S.V. Barinov	75
Investigating the Regularities of Surface Roughness Structuring while Processing with Surface Plastic Deformation for Calculation I. Telkov	79
Determination of the Energy Parameters of the Shock Mechanism Used to Harden the Surface by Plastic Deformation A. Kirichek and S.A. Silant'ev	85
Dependence of Silicon and Manganese Content in the Weld Metal on the Welding Current and Method of Gas Shielding D.A. Chinakhov	92
Influence of Power Supply Energy Characteristics upon the Stability of MMA Process D.P. Ilyashchenko, D.A. Chinakhov and Y.M. Gotovshchik	97
Calculation of the Heat Content of the Electrode Metal Droplet When Applying Power Supplies for Manual Arc Welding with Different Volt-Ampere Characteristic D.P. Ilyashchenko, D.A. Chinakhov and Y.M. Gotovshchik	101

Diffusion and Mechanical Stresses in a Material with Two-Component Coating at External Heating M. Chepak-Gizbrekht and A.G. Knyazeva	105
Towards Energy Intensity Reduction of Machining Fabrication Procedures A.V. Karpov	111
Machinability of Calcium Steel in Deep Hole Drilling with Small Diameters Gun Drills S.V. Kirsanov and A. Babaev	116
Study of the Rheological Properties of Materials at the Blade Processing on Example of Milling Nickel-Chromium Alloy 10H11N23T3 MR VD A.I. Khaimovich, A.V. Balyakin and N. Galkina	120
Influence of Chip Formation Characteristics on Flank Contact Load Distribution in Titanium Alloy Cutting V. Kozlov and X. Li	126
Increasing Efficiency by Applying the Arc Covered-Electrode Welding for Repairing Magnetized Pipelines A.S. Kiselev, A.S. Gordynets, R.I. Dedyuh, Y.N. Saraev and V.P. Bezborodov	132
Specifics of Welded Joint Destruction Obtained by Friction Stir Welding at Strain E. Kolubaev, O. Sizova, A. Zaikina and A. Levihina	137
Reduction of Metal Consumption in View of Mining Cutting Tools Operation S.A. Prokopenko	144
Assessing the Metal Consumption for Manufacturing a Conical Part by Hollow Billet Crimp-Expansion and Sheet Blanks Drawing Crimping S. Zvonov and A. Shlyapugin	150

Chapter 2: Material Engineering and Technologies

Thermally Conductive Polymeric Materials and their Usage in LED-Devices S.M. Lebedev, O.S. Gefle and E.T. Amitov	159
Influence of Crystal Defects on the Reflectivity of the Aluminum S.P. Umnov, O.K. Asainov and A.N. Lemachko	164
Copper Removal from Industrial Wastewaters by Natural Clinoptilolite and Mordenite V. Petranovskii, M. Khrepoun, A. Efimov and A. Pestryakov	169
Inquiring into Structure of Hyperbranched Polyethylene Produced in Radical Polymerization Process E. Koval, L. Echevskaya, M. Matsko, A. Pestryakov and E. Mayer	173
Assumed Mechanism of Polymeric Deposit Formation in Recycle Propylene Washing Column during Bulk Polymerization E. Mayer, A. Trofimova, V. Mashukov and A. Pestryakov	179
Modeling of Mechanical Behavior of Ceramic Nanocomposites I.K. Vaganova, E.G. Skripnyak, V.V. Skripnyak and V.A. Skripnyak	187
Multiscale Simulation of Porous Quasi-Brittle Ceramics Fracture V.V. Skripnyak, E.G. Skripnyak, V.A. Skripnyak, I.K. Vaganova, A.M. Bragov, A.K. Lomunov and L.A. Igumnov	196
Mechanical Behavior of Light Alloys with Bimodal Grain Size Distribution V.A. Skripnyak, E.G. Skripnyak and N.V. Skripnyak	205
Influence of Layer-by-Layer Laser Sintering Modes on the Roughness and Thickness of Sintered Layer of Copper Powder N. Saprykina, A. Saprykin and S.M. Emelyanenko	214
Comparison of Activation Technologies Powder ECP-1 for the Synthesis of Products Using SLS E.V. Babakova, A.V. Gradoboev, A. Saprykin, E.A. Ibragimov, V.I. Yakovlev and A. Sobachkin	220
An Application of Spark Plasma Sintering for Compaction of Refractory Oxides and Nitrides S.V. Matrenin, B. Ovechkin and R.V. Tayukin	225
A Cylindrical Shell Made of Glass-Metal Composite V.V. Pikul, V.K. Goncharuk and I.G. Maslennikova	230

Formation of Gradient Multiphase Nanostructured Surface Layers Using the Electron-Ion-Plasma Combined Method	
Y.F. Ivanov, A.D. Teresov, O.V. Ivanova, V. Gromov, E.A. Budovskikh and A.A. Klopotov	236
Phase Formation in the Ti-Y-O System Formed Using High-Energy Methods	
Y.F. Ivanov, E.A. Petrikova, A.D. Teresov, A.A. Klopotov, V. Gromov, E.A. Budovskikh, M.P. Kalashnikov and V.D. Klopotov	243
Formation of Ceramic Crock Structure Made of Technogenic Raw Materials with Vanadium Component	
A.Y. Stolboushkin, A. Fomin and O. Stolboushkina	250
Development of Composition and Research of Rheological Properties of Thermoplastic Slips on the Basis of Aluminium Nitride	
A.A. Ditts, I.B. Revva, V. Pogrebenkov, Y. Pautova, A. Nazarova, E. Galashov and R. Tarnovskiy	257
Hardening of Metallurgical Machinery Components by Facing with Heatproof, Hard Steels and Low Temperature Pre-Heating	
N.N. Malushin, D.V. Valuev, V.L. Osetkovsky, A.V. Valueva and A. Serikbol	263
Volume Self-Sustained Discharge in Atmospheric Pressure Gas with High Pulse Repetition Frequency	
M.V. Zhuravlev, G.E. Remnev and B.G. Shubin	269
Production Tribological Behavior Feature of Metallic Nanoparticle Additives	
S.A. Belyaev, N.V. Martyushev and I.V. Belyaeva	275
Structure and Properties of Multicomponent Tin Leaded Bronzes upon Die-Casting Depending on Pouring Temperature	
A.V. Korchmit, N.V. Martyushev, S.Y. Tarasov and O.S. Kvashnina	281
Physical-Mechanical Properties of Corundum-Zirconium Ceramic Obtained by the Technology of Radial Magnetoimpulse Pressing	
S.V. Akarachkin, A.A. Sivkov, A.S. Ivashutenko and N.V. Martyushev	286
Influence of Phase Composition on Properties of Corundum-Zirconium Ceramic	
A.S. Ivashutenko, N.V. Martyushev and V.P. Bezborodov	293
Oxide Powder Plasma Processing by Low-Energy Ions of Titanium	
E.M. Vodopyanov, A.V. Loginova, A.S. Ivashutenko and N.V. Martyushev	299
Structure and Properties of Multicomponent Bronze Depending on the Crystallization Conditions	
A.V. Korchmit and N.V. Martyushev	303
Mechanical Properties of Spun Castings of Multicomponent Bronze Depending on the Casting Conditions	
A.V. Korchmit and N.V. Martyushev	308
Low-Melting Glass-Ceramic Composites with Low Linear Thermal Expansion Coefficient for Radio-Electronics	
V.M. Pogrebenkov, K.S. Kostikov, E.A. Sudarev, A.V. Elistratova, K.S. Kamyshnaya and T.V. Kolesova	313
Phase Composition and Mechanical Properties Modification in Cr/Ti System by Short-Pulsed High Intensity Ion Beams Treatment	
V.I. Shymanski, G.E. Remnev, S.K. Pavlov and V.V. Uglov	319
Investigation of Ultradispersed Powders Fe_xO_y Obtained in the Electric Discharge Plasma	
A.A. Sivkov, A.S. Ivashutenko, A.A. Lomakina and I.I. Shanenkov	325

Chapter 3: Modelling and Numerical Simulation, Algorithms and Mathematical Methods for Applied Problems

Experimental Studies of Counter Vortex Flows Modeling	
P. Churin, S. Kapustin, G. Orehov and O. Poddaeva	331
Gas Injection into Porous Reservoir Partly Saturated by Water	
M.K. Khasanov	336
Experimental Study of Forest Fuel Ignition by the Source of Limited Energy Capacity	
N. Baranovskiy and A. Zakharevich	342
Finite Element Modeling of Delamination Propagation in Composite Laminates	
Y.V. Skvortsov, S.A. Chernyakin, S.V. Glushkov and S.N. Perov	347

Numerical Analysis of Inverse Problems for the Model of Transfer of Industrial Environmental Pollution in the Machine-Building O.V. Soboleva and D.V. Mashkov	353
Simulation of a Flexible Mirror Performance in the Problem of Adaptive Compensation for Aberrations in an Optical System F. Kanev, D. Rytchikov and N. Makenova	359
Calculation of Heat Exchange Characteristics Transpiration Cooling Systems A.S. Yakimov	365
Calculation of Effective Coefficient of Thermal Expansion for Composite ‘Glass-Eucryptite’ Changing during Sintering A.G. Knyazeva, O.N. Kryukova and K.S. Kostikov	372
Dynamic Susceptibility of a System O.M. Gerget, V.A. Kochegurov and E.Y. Titarenko	378
An Improvement of the Concept Design Analysis Method by the Use of the Avoidance Function A.A. Khamukhin and M.H. Eres	382
Dependence of the Effective Diffusion Coefficient of a Matrix Composite on the Size of Inhomogeneities M.A. Anisimova and I. Sevostianov	389
Influence of the Shaper Design of Pneumohydraulic Impact Device on the Form and Duration of the Impact Impulse O.O. Angatkina, P.Y. Krauinsch and V.N. Deryusheva	394
Influence of Method Used for Calculating of Effective Properties on Stressed-Strain State of Composite Plate under Nonstationary Heating Y.A. Chumakov and A.G. Knyazeva	402
Numerical Simulation of Multilayer Composites Failure under Dynamic Loading S.A. Zelepugin and A.S. Zelepugin	408
Study of the Effect of the Rolling Mill Inter-Stand Tension on the Strip Gauge Deviation A.A. Radionov, I.Y. Andryushin, A.S. Karandaev, V.R. Khrumshin and R.R. Khrumshin	414
Thermo-Physical Model of the Lamellate System Grinding I.V. Shmidt and A.A. Dyakonov	420
Tessellation Methods for Modeling the Material Structure L. Burtseva, F. Werner, B. Valdes, A. Pestryakov, R. Romero and V. Petranovskii	426
Optimization Method in 2-D Problems of Material Body Cloaking G.V. Alekseev and A. Lobanov	436
Mathematical Modelling of an Arch Tooth Surface as an Envelope N.R. Shcherbakov, A.M. Bubenichikov and S.M. Kazakavitschus	442
Model of Automatic Distribution of Topologically Related Objects to Layers in Navigation Systems S.V. Ereemeev	447
Theoretical and Experimental Study of Led Luminaire S.Y. Gurin, B.V. Akimov and B.P. Gritsenko	453
The Evolution Equations of Shock Deformation Problems with Plane Surfaces of Discontinuities in Elastic Inhomogeneous Mediums V.E. Ragozina and Y.E. Ivanova	459
Numerical Study of Shock Wave Interaction with Protective Stopping with Regard to the Type of its Setting A.E. Baganina, D.Y. Paleev and V.Y. Beglyakov	465
Asymptotic Model of Free Convection Flow on a Vertical Surface in Porous Media with Newtonian Heating A.A. Bocharova, I.V. Plaksina and A.A. Obushnyy	469
Two-Wave Processes in the Magnetic Vibrations of a String A.K. Tomilin	476
Attenuation of Acoustic Waves in Metal Barriers A.E. Baganina, D.Y. Paleev and A.A. Kazantsev	482
Comparison of Cable Insulation Control in Weak and Strong Electric Fields N.S. Starikova, V.V. Redko and G. Vavilova	486
Numerical Investigation of Compression Wave Attenuation in Water Barriers A.E. Baganina, D.Y. Paleev and M.Y. Blaschuk	491

The Synthesis, Designing and Analysis of the Spatial Mechanisms with Imposed Constraints A. Fomin	495
Organization of Continuous Process Simulation via E-Network D. Tarakanov, G. Tcapko, S. Tsapko and I. Savenko	500
Numerical Simulation of Neural Network Components of Controlling and Measuring Systems S.N. Danilin, M.V. Makarov and S.A. Shchanikov	507
Numerical Simulation of High-Speed Orthogonal Cutting of Metals A.S. Zelepugin and S.A. Zelepugin	513
Buckling Analysis of Stiffened Plates by Ritz Method L.M. Savelyev and O.V. Borisova	518
Boundary Element Approach in Impedance Cloaking Problem A. Baydin and O. Larkina	524
The Influence of Grain Form on Effective Diffusion Coefficient of Polycrystalline M. Chepak-Gizbrekht and A.G. Knyazeva	529
Mathematical Modeling of Pulsed Electric-Sintering Powders S.N. Sorokova, A.G. Knyazeva, A. Pobol and G. Goranskyi	534
Stressed-Strain State of Multi Layer Foil under One-Axis Tension V.N. Demidov and A.G. Knyazeva	540
Determination of Effect of Salt Content in Cooling Liquid on the Result of Cable Capacitance per Unit Length Measurement M. Grigoriev, G. Vavilova and N.S. Starikova	546
A Simple Method for Solving Dynamic Problems of Robotics A.M. Bubenchikov, E.E. Libin and Y.P. Hudobina	552
The Method of the Centerless Roundness Measuring with Corrective Adjustment O.V. Zakharov, A.V. Korolev, A.A. Korolev and A.V. Kochetkov	556

Chapter 4: Control and Automation Systems, Manufacturing Applications

Mobile Water Treatment Complex A.G. Goryunov, F. Manenti, K.A. Kozin, S.A. Baydali, I.S. Nadezhdin and R.V. Potemin	565
Method of Control of Object Positioning System and Device Scheme V. Kurgankin and V. Zamyatin	571
Frequency Domain Sensors and Frequency Measurement Techniques F.N. Murrieta-Rico, V. Petranovskii, O.Y. Sergiyenko, D. Hernandez-Balbuena, A. Pestryakov and V. Tyrsa	575
Predictive Inverse Neurocontrol with Recycled Reference Trajectory K.V. Zmeu, N.A. Markov, B.S. Notkin and I.A. Shipitko	585
Improvement of Algorithms for Automatic Gauge Control System of the Hot-Rolling Mill A.S. Karandaev, V.R. Khramshin, I.Y. Andryushin, A.G. Shubin and B.M. Loginov	592
Synthesis of Three-Dimensional Models from Drawings Based on Spectral Graph Theory A. Zakharov and A. Zhiznyakov	598
Production Processes Management by Simulation in Tecnomatix Plant Simulation V.V. Kokareva, A.N. Malyhin and V.G. Smelov	604
On Creation of Energy-Saving Hydraulic Impact Devices S. Lazutkin	610
Measurement of the Current Transfer Function for Power Transducers of Current to Voltage P.F. Baranov, V.N. Borikov and E.I. Tsimbalist	615
Utilization Prospects of Coalbed Methane in Kuzbass O.V. Tailakov, D.N. Zastrelov, V.O. Tailakov and A.B. Efremenkov	622
Multidimensional Fuzzy Control System Development of Oil Transportation and Treatment Technological Processes Based on the Input/Output Parameters Model in the Precise Terms Set Form A. Sagdatullin	626

Intellectual Control of Oil and Gas Transportation System by Multidimensional Fuzzy Controllers with Precise Terms	
A. Sagdatullin, A. Emekeev and E.A. Muravyova	633
Adaptive Structural Reconfigurable Algorithms of Control	
S.V. Shidlovskiy and V.I. Syryamkin	640
Development of a Combined Algorithm for Request Distribution Using Multi-Objective Optimization Methods	
A.O. Igumnov, D.M. Sonkin and S.A. Khrul	646
Developing a Procedure for Technical Status Control of a Turbine Compressor Package Blades	
Y. Klochkov, L. Papic, I. Vasilieva and A. Gazizulina	652
Determination of Cutting Forces in Oblique Cutting	
A.V. Filippov and E.O. Filippova	659

Chapter 5: Image and Signal Processing, Recognition, Information Processing and Applied Technologies

Object's Border and Position Allocating in an X-Ray Image	
I.V. Tsapko and A.V. Vlasov	667
Benchmark for FFT Libraries	
S. Chilingaryan, A. Shkarin, R. Shkarin, M. Vogelgesang and S. Tsapko	673
Imaging Based on Signal from Side-Scan Sonar	
I.V. Prokhorov and A.A. Sushchenko	678
Adaptive Neuro-Fuzzy Recognition Technology Intersecting Objects	
S. Gorbachev and V. Syryamkin	683
Development of a Neuronetwork Component for Technical Systems of Mechanical Engineering	
S.N. Danilin, M.V. Makarov and S.A. Shchanikov	689
Application of Convolutional Neural Networks for Automatic Number Plate Recognition on Complex Background Images	
A.A. Druki, J.A. Bolotova and V.G. Spitsyn	695
Use of Local Characteristics of Self-Similarity of Digital Images for Solving the Problems of Crack Detection	
A.L. Zhiznyakov and D.G. Privezentsev	704
Expert Evaluation of the Quality of the Development of New Technics' Samples: Experience in the Development of a New Kind of Multipurpose Shield-Type Heading Machine	
D. Nesteruk, M. Momot, V. Beglyakov and E. Politsinskaya	709
Mobile Devices for Plants Models Obtaining with the Possibility of Data Transition (by Ethernet)	
I.O. Ilyin, A.V. Kudryavtsev and V.A. Onufriev	714