

# Table of Contents

## Preface, Conference Committee

## Chapter 1: Functional and Special Structural Materials, Technologies of Coatings, Strengthening and Hardening

<b>Magnesium Dry Mixes for Outer Wall Decoration</b> V.V. Zimich	3
<b>Research the Properties of Temperature High-Coercivity Permanent Magnets NdFeB</b> F. Ismagilov, V. Vavilov and D. Farrakhov	8
<b>Justification of the Choice Matrix Material of the Magnetoactive Elastomer for Working Camera-Channel Peristaltic Unit</b> M.A. Vasilyeva	13
<b>Process Engineering of Dimensional Fused Silica Etching</b> N. Shaburova, T.D. Ratmanov and D.D. Larionov	20
<b>Amorphous Copper-Based Alloys: Structure, Technology and Properties</b> A. Tiagunov, V.S. Tsepelev and G.V. Tiagunov	26
<b>Increasing Corrosion Properties of Steel 04Cr25Ni6NMo3</b> M.A. Matveeva and I.V. Chumanov	31
<b>Mathematical Model of Nanostructure Formation in Binary Alloys at Electron Beam Treatment</b> S.A. Nevskii, V. Sarychev, S.V. Konovalov, D. Kosinov and I. Panchenko	34
<b>Nanostructured Strengthening of Springs and Spring Steels</b> O.I. Shavrin and A.N. Skvortsov	40
<b>Application Features of the Cutting Tool, Hardened by Laser Pulsed Radiation</b> S.I. Yaresko	46
<b>Titanium-Containing Composite Sorbent-Photocatalyst Based on Calcium Silicates and Aluminosilicates</b> G.G. Mikhailov, A.G. Morozova and T.M. Lonzinger	52
<b>Evolution of Macro-Scale Plastic Flow Localization of Tri-Layered Stainless Steel - Low Carbon Steel - Stainless Steel Metal with Digital Image Correlation Method</b> S.A. Barannikova, L.B. Zuev, A.V. Bochkareva, A.G. Lunev, J. Li and G. Shlyakhova	60
<b>Barium Hexaferrite Single Crystal Growth Using PbO and Na<sub>2</sub>O Based Flux</b> D. Vinnik, S.A. Gudkova and R. Niewa	66
<b>Experimental Study of Ba<sub>7</sub>Fe<sub>4</sub>O<sub>13</sub>, Ba<sub>3</sub>Fe<sub>2</sub>O<sub>6</sub>, Ba<sub>2</sub>Fe<sub>2</sub>O<sub>5</sub>, BaFe<sub>2</sub>O<sub>4</sub> Barium Ferrites</b> D. Vinnik, M.V. Sudarikov and V.E. Zhivulin	70
<b>Microcrystalline and Amorphous Photovoltaic Silicon Materials Performance Optimization</b> S.N. Chebotarev, A.S. Pashchenko and D.A. Arustamyan	74
<b>Corrosion-Resistance of MAO-Coatings on Al-Si Alloys</b> N.Y. Dudareva, M.M. Abramova and R.V. Kalschikov	83
<b>Analysis of Electrodynamics Properties of Materials with High Dispersity Metal Powder in Axial Moving Systems</b> K.M. Zeyde	90
<b>Study of Thermal Resistance and Mechanical Properties of Thin Sheets of Low-Alloyed Aluminum Al-Cu-Mn and Al-Mg-Si Alloys</b> E.G. Demyanenko and I.P. Popov	95
<b>The Influence of Electromagnetic Field Microwave on Physical and Mechanical Characteristics of CFRP (Carbon Fiber Reinforced Polymer) Structural</b> I.V. Zlobina and N.V. Bekrenev	101
<b>Phase Equilibria in the Copper-Rich Corner of the Cu-Ni-Si-Cr System</b> O.V. Samoilova and E.A. Trofimov	107
<b>Synthesis of Multilayer Vacuum Ion-Plasma Coatings Ti-Tin during the Surface Modification</b> S.R. Shekhtman and N.A. Sukhova	113

<b>Comparative Analysis of Catalytic Activity in Complex NiO-CuO-Fe<sub>2</sub>O<sub>3</sub>-Cr<sub>2</sub>O<sub>3</sub> Oxide System of Different Production Technologies</b> V.M. Chernyshev and N.P. Shabelskaya	118
<b>Modification of Nanostructured Maraging Steels Surface with Atmospheric Nitrogen at Steel Hardening in Confined Space</b> T.M. Makhneva and V.B. Dement'yev	123
<b>Thermal Diffusion Galvanizing in Ferriferous Zinc Powder</b> R. Galin, N. Shaburova and D. Zakharyevich	129
<b>The Structure of Carbon Nanotube Exohedral Complexes with Lithium in a Wide Range of Concentrations</b> S.A. Sozykin, V.P. Beskachko and G.P. Vyatkin	135
<b>Peculiarities of Forming of the Wear-Resistant Cast Iron Coating Structure on Steel 45 upon Plasma-Powder Surfacing</b> S.P. Nefed'yev, K.N. Vdovin and A.N. Emelyushin	141
<b>Hardening Process by Complex Local Deformation Investigation</b> V.A. Golenkov, S.Y. Radchenko and I.M. Gryadunov	149
<b>Metallographic Examination of Forming Improved Mechanical Properties via Surfacing of Steel HARDOX 450 with Flux Cored Wire</b> S.V. Konovalov, V. Kormyshev, V. Gromov and Y.F. Ivanov	159
<b>Foamer Influence on the Foam Concrete Properties Obtained in the High-Speed Foam Generator</b> N.A. Mashkin and E.A. Bartenjeva	163
<b>Effect of the High-Heating on the Chemical and Phase Composition of the Al-Ni-Cr Layered Coatings</b> V.G. Shmorgun, A.I. Bogdanov and A.O. Taube	169
<b>Development of Resource-Saving Cellular Glass Technology and Materials Based on it</b> E.A. Yatsenko, V.A. Smoliy and B.M. Goltsman	175
<b>Heat Treatment of Wear Resistant Steels for Mud Pumps</b> S.M. Nikiforova, M.A. Filippov and A.S. Zhilin	181
<b>Superplastic Behavior of an Al-Cu-Mg-Mn-Ag Alloy</b> F.F. Musin, B.O. Bolshakov and E. Domracheva	185
<b>Use of Mathematical Modeling in Building Ceramics Functional Properties Studies</b> N.A. Vil'bitskaya, S.A. Vilbitsky and A.G. Avakyan	191
<b>Pore-Forming Additives for Ceramic Gravel Production Made of Technogenic Materials</b> N.Y. Kiryushina and N.S. Lupandina	196
<b>Analysis of Physico-Mechanical Properties of Composites Based on Polylactide and Thermally Modified Wood Fibers</b> N.R. Galyavetdinov, R.R. Safin and A.E. Voronin	202
<b>Investigation of Relationship between Structural and Crystallographic Condition of some Constructional Materials and their Mechanical Properties</b> V.V. Novokreschenov, R.V. Rodyakina and M.A. Karimbekov	207
<b>The Structure and Phase Composition of the Diffusion Zone in a Titanium and Steel Composite</b> V.G. Shmorgun, O.V. Slautin and R.E. Novikov	214
<b>Work Softening and Low Cycle Fatigue of Molybdenum Alloy under Force-Controlled Loading and Elevated Temperatures</b> S.P. Samoilov and A.O. Cherniavsky	219
<b>FE Analysis of the Applicability of the Shear-Compression Testing to the Modeling of the Asymmetric Rolling Process</b> A.M. Pesin and D.O. Pustovoytov	226
<b>The Impact of Explosion Welding Parameters on Al/Cu Laminated Composites Interface</b> D.V. Pronichev, L.M. Gurevich and M.D. Trunov	234
<b>Investigation of the Diffusion Processes at the Interface of the Cu/Ti Metal Composite</b> V.G. Shmorgun, D.A. Evstropov and M.D. Trunov	239
<b>The Study of the Dissolution AlZr<sub>2</sub> Ligatures in the Liquid Alloy AlMg<sub>6</sub>Mn<sub>1</sub></b> O.A. Chikova, B.V. Ovsyannikov and P.L. Reznik	243
<b>Tin and Nickel Influence on the Structure and Properties of the Lead Bronze Obtained by Means of the Centrifugal Casting</b> N.S. Klochkov, U.P. Egorov, C. Mapelli and I.K. Zabrodina	248

<b>Dislocation Structure Evolution during Plastic Deformation of Low-Carbon Steel</b> G.I. Raab, Y.M. Podrezov and G.N. Aleshin	253
<b>Hot Deformation of Martensitic and Supermartensitic Stainless Steels</b> A.M. Akhmed'yanov, S.V. Rushchits and M.A. Smirnov	259
<b>The Effect of Aluminum Oxide Additives on the Phase Equilibrium in Borosilicate Systems and Crystallization of Borosilicate Melts</b> V.E. Eremyashev, E.A. Trofimov and T.O. Podbornykh	265
<b>Plating Technology for Contact Joint Performance Improvement in Electrical Equipment</b> V.V. Goman and S.A. Fedoreev	271
<b>Experimental Study of Contact Joint Characteristics in Electrical Equipment</b> V.V. Goman and S.A. Fedoreev	276
<b>Experimental Study and Thermodynamic Modeling of Phase Equilibria in the PbO-Fe<sub>2</sub>O<sub>3</sub> System</b> D. Vinnik, E.A. Trofimov and D.A. Zherebtsov	282
<b>Determination Features of the Component Diffusion Coefficients of the Fe-Cr-Ni-Gr Powder Systems Sintering</b> V.G. Perederiy, B.G. Gasanov and P.V. Sirotin	286
<b>Determination of Suitable Binder Grade According to the Superpave Mix Design Method for Southern Russia</b> S.K. Iliopolov, E.V. Uglova and K.D. Golyubin	293
<b>Auger and X-Ray Photoelectron Spectroscopy Study of the Tribocontact Surface after Laser Modification</b> A.V. Sidashov, A.T. Kozakov and S.I. Yaresko	298
<b>The Formation and Functioning of Surface Nanostructures at Tribocontact</b> N.A. Myasnikova, A.V. Sidashov and P.V. Myasnikov	303
<b>Gas Atomization of the Liquid 82N7HSR Nickel Base Alloy to Produce Micropowder for Additive and Coating Technologies</b> P.A. Lykov, R.M. Baitimerov and D.A. Zherebtsov	309
<b>The Manufacturing of the AlSi12-Al<sub>2</sub>O<sub>3</sub> Composite Powder for Additive Production Methods</b> P.A. Lykov, S.B. Sapozhnikov and R.M. Baitimerov	314
<b>The Study of the Contact Angle of Silicon Carbide High-Carbon Iron Melt</b> A.N. Anikeev, I.V. Chumanov and V.I. Chumanov	318
<b>Magnetic and Microstructure Study of Thin Films of FeCuNbMoSiB FINEMET Alloy</b> I.A. Zakharchuk, E. Mikhailsyna and E. Lähderanta	322
<b>Calculation of the Amount of the Reduction Required for the Formation of Compound Layers during Cold Rolling of Bimetals</b> A.V. Shaparev and I. Savin	328
<b>Application of Ion-Plasma Coatings with Low Droplet Phase Content</b> N.K. Krioni, A.D. Mingazhev and I.R. Kuzeev	334
<b>The Effect of the Cast High-Manganese Steel Primary Structure on its Properties</b> K.N. Vdovin, N.A. Feoktistov and D.A. Gorlenko	339
<b>Use of the Electric Steel Melting Slag in Production of the Expanded Clay Gravel</b> T.A. Vasilenko	345
<b>The Study of Aging Cold Rolled and Hot Dip Galvanized Automotive Steel</b> L.V. Radionova and Y.M. Subbotina	352
<b>Electropulse Machining of Metals</b> N. Shaburova and V.V. Krymsky	360
<b>Opening Wave Strain Strengthening</b> A.V. Kirichek, A.V. Soloviyov and S.A. Silantiev	364
<b>Synthesis of Transition Metals Carbide Compounds in the Vacuum Arc Discharge Plasma</b> D.K. Kostrin and A.A. Lisenkov	371
<b>Increasing the Intensity of Cementation Process of Tool Low-Alloy Steels by Surface Laser Treatment</b> E.A. Marinin, S.P. Grachev and A.L. Flaxman	377
<b>Gear Wheels Surface Engineering by Deformation Hardening and Carburization</b> S.A. Pakhomova, M.V. Unchikova and R.S. Fakhurtdinov	383

<b>Peculiarities of Thermal Hardening of Experimental Sparingly-Alloy Tool-Class Steels</b> S.E. Krylova, E.V. Romashkov and A.V. Kuznetsov	392
<b>Modern Methods and Technological Solutions for Effective Processing of Gear Wheels</b> S. Egorov, A. Kapitanov and D. Loktev	397
<b>Formation and Structure of Diffusional Zinc Coatings Formed in Nanocrystallized Zinc Powders</b> R. Galin, D. Zakharyevich and S.V. Rushchits	404
<b>Kinetic Description of (Cr, Fe)<sub>7</sub>C<sub>3</sub> Carbide Dissolution in Austenite of High-Carbon Fe-Cr-C Ternary Alloys</b> A.S. Sozykina, K.Y. Okishev, A.G. Grebenshchikova and D.A. Mirzaev	409
<b>Plasma-Electrolytic Treatment as an Innovative and Resource-Saving Technology of Metal Surface Treatment</b> V.L. Steblyanko and A.P. Ponomarev	416
<b>X-Ray Microanalysis of Hardmetal Powder, Produced by Electroerosion Dispersion of VK8 Alloy in Kerosene Environment</b> E.V. Ageev, A.Y. Altukhov and S.S. Gulidin	422

## **Chapter 2: Innovative Technologies in Metallurgy Industry and Materials Processing**

<b>Investigation of the Surface Layer Structure of High-Chromium and High-Strength Steels at the Variation of the Heating Temperature</b> V.B. Dementyev and T.N. Ivanova	431
<b>SHS Ferroaluminum Obtained from the Disperse Waste of Engineering</b> G.N. Safronov, N.N. Safronov and L.R. Kharisov	437
<b>Changing the Arc Efficiency during Melting of a Charge in Arc Steel Melting Furnaces</b> A.N. Makarov, M.K. Galicheva and A.V. Kuznetsov	441
<b>Energy Reduction Technologies Based on the Lubricant Supply in the Roll Contact System "Quarto" during the Hot Strip Rolling</b> M.V. Kharchenko, R.R. Dema and V.I. Bilichenko	446
<b>Technology of Packing Materials for Metal Products</b> L.G. Kolyada, E.V. Tarasyuk and N.L. Kalugina	454
<b>Effect of Stress-Strain State during Combined Deformation on Microstructure Evolution of High Carbon Steel Wire</b> A. Gulin, M. Polyakova and E. Golubchik	460
<b>Determination of the Basic Parameters of the Recovery Process for Extracting Iron from Iron and Steel Slag</b> T.V. Sviridova, O.B. Bobrova and E.A. Volkova	466
<b>Experimental Investigation of Al-Alloy Directional Solidification in Pulsed Electromagnetic Field</b> D.A. Musaeva, E. Baake and V.K. Ilin	471
<b>The Study of the Fluoroapatite of the Fine Coal Yuzhno-Yakut Basin</b> E.V. Gunina	477
<b>Influence of the Microstructure Al-12%Si Alloy on the Properties of the Oxide Layer Formed with MAO</b> S.K. Kiseleva, L.I. Zaynullina and N.Y. Dudareva	481
<b>Neural Network Modeling of Coefficient of Burden Resistance to the Gas Movement in the Lower Part of the Blast Furnace in Conditions of Operation with Coke Nut</b> S.K. Sibagatullin, A.S. Kharchenko and M.V. Potapova	487
<b>On Advanced Recycling Technology for Cutting Fluid and Waste Oils Produced at the Metallurgical Enterprises</b> G.I. Pavlov, O.R. Sitnikov and A.V. Kochergin	492
<b>Structure Investigation of the Constructional Steel St3ps after Argon-Arc Plasma Treatment</b> E.P. Nikolaeva	500
<b>Efficiency Improvement of Sintering as a Result of Surface-Active Substance Use in Pelletizing at the JSC "Ural Steel"</b> A.N. Shapovalov, R.R. Dema and S.P. Nefedyeu	507

<b>Calculation of Impeded Shrinkage Casting Processes in Sand Layer</b> V.M. Kolokoltsev, A.S. Savinov and A.S. Tuboltseva	516
<b>Narrow Jet Plasma as the Energy Efficient and Safe Technology for Metal Cutting</b> S.V. Anakhov, Y.A. Pyckin and A.V. Matushkin	523
<b>Modeling of the High Temperature Creep and Rupture under the Complex Stress State</b> T.R. Stepanova and T.V. Prokhorova	528
<b>Liquid-Phase Recovery of the Metallurgical Slag Using Induction Heating Installation</b> A.N. Dildin and I.V. Chumanov	535
<b>Experimental Substantiation of a Method of Improving the Efficiency of Ultrasonic Drilling of Small Diameter Holes</b> G.K. Muldasheva, I.V. Zlobina and N.V. Bekrenev	539
<b>Solution to the Diffusion Problem in the Thermocyclic Nitrocementation of Steel</b> Y.S. Bakhracheva, A.V. Vasilyev and T.N. Petikova	545
<b>Interaction of Hydrogen Atoms with Vacancies and Divacancies in bcc Iron</b> A.V. Verkhovyykh, A.A. Mirzoev, G.E. Ruzanova, D.A. Mirzaev and K.Y. Okishev	550
<b>Estimation of the Heat Stability of Hardened Cr-V Cast Irons</b> Y.D. Koryagin and V.L. Il'ichev	558
<b>Applying Thermal Coatings to Narrow Walls of the Continuous-Casting Molds</b> S. Gorbatyuk, A.A. Gerasimova and N.N. Belkina	564
<b>Electropulse Processing of Gold-Bearing Ore</b> V.V. Krymsky, E.V. Litvinova and J.G. Mingazheva	568
<b>Mathematical Modeling of Mechanized Technologies Soldering</b> V.N. Shtennikov	573
<b>Carbon in Solidphase Reduction of Oxides</b> A.V. Senin	578
<b>Influence of Steel Chemical Composition and Modes of the Thermomechanical Treatment on Mechanical Properties of a Hot Rolled Plate</b> V.M. Salganik, D.N. Chikishev and E.B. Pozhidaeva	584
<b>Optimization of Welding Electrode Coating Composition Based on Simulation of Interaction Processes in Metal-Slag-Gas System</b> M.P. Shalimov and E.B. Votnova	593
<b>Features of Processing of Corrosion Resistant Steels</b> J.L. Chigirinskiy, P.H. Trung and A.A. Lipatov	598
<b>The Study of the Strained State of the Long-Length Aluminum Billet Obtained by a New Method - Multi-ECAP-Conform</b> G.I. Raab, E.I. Fakhretdinova and R.Z. Valiev	603
<b>Linear Friction Welding of a Commercial Aluminum Alloy</b> F.F. Musin, A.Y. Medvedev and B.O. Bolshakov	608
<b>The Effect of the Additional Processing during the Crystallization of a Melt of the AD0 Aluminum Alloy on the Size of Grains</b> E.G. Demyanenko and I.P. Popov	614
<b>Improving the Controlled Cooling after Wire Rod Rolling in the Finishing Block of Stands</b> S.I. Platov, V.A. Nekit and N.N. Ogarkov	620
<b>Separation of Fine Particles with the Set Dimensional and Physical Characteristics by Method of the Crown Separation</b> M.S. Minkin, D.N. Kuimov and A.D. Lukyanov	625
<b>Laser and Hybrid Laser-Arc Welding of High Strength Steel N-A-XTRA-70</b> O. Berdnikova, V. Pozniakov and O. Bushma	630
<b>The Mechanism of Water-Soluble Polymer Additives and Parameters of the Pulse Electrolysis Effect on the Size Distribution of the Electrolytic Copper Powder</b> M.S. Lipkin, M.S. Lipkin and V.I. Lachin	636
<b>Technologies for the Manufacturing of Multi-Layered Hollow Structures by Superplastic Forming</b> N.K. Krioni, A.D. Mingazhev and I.R. Kuzeev	642
<b>Optimal Control of Technological Process of Carburization of Automotive Gears</b> M.Y. Livshits and E.A. Yakubovich	647

### **Chapter 3: Materials and Technologies in Energy Production**

<b>Water-Coal Suspension Preparation Using Electrohydraulic Coal Breakage Method</b> V.A. Dubrovsky, Y.V. Isakov and I.I. Potapov	657
<b>Development and Implementation of Energy Efficient Burners at Power Stations</b> V.A. Dubrovsky, M.V. Zubova and M.U. Potylitsyn	661
<b>Improvement of Liquid Organic Fuel Oils Operational Characteristics with Additives</b> E.R. Zvereva, O.S. Zueva and R.V. Khabibullina	666
<b>Low-Sulfur Fuel and Oil Production</b> D.N. Kuimov, M.S. Minkin and A.D. Lukyanov	671
<b>Optimization of Oil Particles Separation Disperser Parameters</b> V.S. Deeva, S.M. Slobodyan and V.S. Teterin	677
<b>Trends and Problems of Biofuel Market Development in Kazakhstan</b> A.E. Bedelbayeva and G.K. Lukhmanova	683

### **Chapter 4: Technologies and Materials in Food Production**

<b>Sonochemistry Effects Influence on the Adjustments of Raw Materials and Finished Goods Properties in Food Production</b> N.V. Naumenko and I.V. Kalinina	691
<b>Modeling of Potato Convenience of Exposure Effects of Ultrasound</b> I.Y. Potoroko and A.A. Ruskina	697
<b>Effects of the Sonochemistry in the Rheology of Food Media</b> L.A. Tsirulnichenko and N.V. Popova	703
<b>Modern Technological Possibilities of the Environmental Safety of Food Production</b> Y.I. Kretova, S.P. Merenkova and A.A. Lukin	708

### **Chapter 5: Methods of Measurements and Analysis**

<b>Application of Intelligent Technology in Functional Materials Quality Control</b> V.Y. Stolbov, M.B. Gitman and S.I. Sharybin	717
<b>Calculation of Metalwork Life with Allowance for Cyclic Degradation of Material in Operation</b> V.I. Mironov and O.A. Lukashuk	725
<b>The Technology of the Near-Field Interference Microwave Sensing</b> V.P. Belichenko, A.S. Zapasnoy, A.S. Miron'chev and P.V. Shestakov	730
<b>New Method for Determining the Electron Streams in the Metals from the Measured Flows of Scattered Primary Radiation</b> P.M. Kosianov	735