

**NANOMECHANICS SCIENCE & TECHNOLOGY**  
**An International Journal**

**VOLUME 6 TABLE OF CONTENTS**

**ISSUE 1**

THE THEORY OF MEDIA WITH DEFECT FIELDS AND MODELS OF DEFORMATION OF FUNCTIONAL LAYERS IN ISOTROPIC MATERIALS	1
<i>S. A. Lurie, P. A. Belov, &amp; K. D. Kharchenko</i>	
PREDICTION OF THERMOPHYSICAL AND THERMOMECHANICAL PROPERTIES OF HIGH-TEMPERATURE LAYERED COMPOSITES BASED ON THE Al <sub>2</sub> O <sub>3</sub> -Cr SYSTEM	17
<i>R. N. Rizakhanov, A. A. Barmin, M. N. Polyansky, R. I. Rudshtein, S. A. Lurie, &amp; Yu. O. Solyaev</i>	
SIMULATING ALUMINUM NANOCRYSTAL HEATING BY MOLECULAR DYNAMIC AND PHENOMENOLOGICAL METHOD	31
<i>A. V. Fedorov, A. V. Shulgin, &amp; S. A. Lavruk</i>	
INVESTIGATING THE STRUCTURE AND COMPOSITION OF THE PHOTOPOLYMER SAMPLE NEAR SMALL-DIAMETER CHANNELS PRODUCED BY MJM TECHNOLOGY	47
<i>R. M. Kakhramanov &amp; N. L. Rabinskii</i>	
INFLUENCE OF SILICON ADDITION ON THE PHASE COMPOSITION OF ALUMINUM-MATRIX COMPOSITE MATERIALS REINFORCED BY SILICON CARBIDE PARTICLES	57
<i>E. I. Kurbatkina, D. V. Kosolapov, &amp; E. V. Balakirev</i>	
STRUCTURE OF GENERALIZED THEORIES OF ELASTICITY OF MEDIA WITH DEFECTIVE FIELDS AND OF GRADIENT THEORIES	65
<i>P. A. Belov, S. A. Lurie, &amp; C. Qi</i>	

## ISSUE 2

STRUCTURE AND PROPERTIES OF ULTRAHIGH MOLECULAR WEIGHT POLYETHYLENE FILLED WITH TUNGSTEN BORIDE AND CARBON BLACK	87
<i>A. A. Boykov, V. V. Tcherdyntsev, &amp; V. N. Gulbin</i>	
SYNTHESIS, CHARACTERIZATION, AND APPLICATIONS OF Ni-SUBSTITUTED Mg–Mn FERROFLUIDS	99
<i>Subbiah Rammohan Chitra</i>	
A MODEL OF CONTACT OF ELASTIC BODIES WITH ACCOUNT FOR THEIR ADHESION	117
<i>N. A. Dolgov, S. N. Romashin, L. Yu. Frolenkova, &amp; V. S. Shorkin</i>	
MODEL OF ANISOTROPIC ELASTOPLASTICITY IN FINITE DEFORMATIONS ALLOWING FOR THE EVOLUTION OF THE SYMMETRY GROUP	135
<i>Massimo Cuomo &amp; Mario Fagone</i>	
FREQUENCY SHIFTS INDUCED BY LARGE DEFORMATIONS IN PLANAR PANTOGRAPHIC CONTINUA	161
<i>Antonio Battista, Christian Cardillo, Dionisio Del Vescovo, Nicola Luigi Rizzi, &amp; Emilio Turco</i>	

## ISSUE 3

A NEW MODEL FOR CONTACT INTERACTION BETWEEN AN ATOMIC FORCE MICROSCOPE PROBE AND A SAMPLE	179
<i>N. I. Uzhegova &amp; A. L. Svistkov</i>	
EXPERIMENTAL INVESTIGATIONS OF MECHANICAL CHARACTERISTICS OF POWDER COATINGS ON AN EPOXY–POLYESTER SUBSTRATE BY NANOINDENTATION	193
<i>A. G. Getmanov, Yu. V. Kornev, M. I. Martirosov, &amp; L. N. Rabinskiy</i>	
THE EFFECTIVE LENGTH OF A NANOFILLER AND REINFORCEMENT DEGREE OF POLYMER/CARBON NANOTUBES (NANOFILAMENTS) NANOCOMPOSITES	203
<i>Georgii V. Kozlov, Azha Ch. Aygubova, Yulia N. Karnet, &amp; Gasan M. Magomedov</i>	

SIMULATION OF HEAT AND MASS TRANSFER IN PORES AS APPLIED TO SYNTHESIS OF MAGNESIUM-ZINC AND NICKEL-ZINC FERRITE NANOPARTICLES	209
<i>A. A. Markov,, M. A. Hobosyan, &amp; K. S. Martirosyan</i>	
INFLUENCE OF MORPHOLOGY AND PHASE CONSTITUTION ON CREEP PROPERTIES OF LOW-CARBON MARTENSITIC STEEL	223
<i>N. V. Kolebina &amp; V. L. Danilov</i>	
MODELING THE HEALING OF MICROCRACKS IN METAL STIMULATED BY A PULSED HIGH-ENERGY ELECTROMAGNETIC FIELD. PART I	233
<i>Konstantin V. Kukudzhanov &amp; Alexander L. Levitin</i>	

## ISSUE 4

MECHANICAL PROPERTIES OF CARBON FIBER-REINFORCED PLASTIC CONTAINING ADDITIONS OF FULLERENE SOOT	251
<i>A. V. Artemiev, A. V. Afanasiev, L. N. Rabinskiy, &amp; Jo Aung Lin</i>	
MODELING THE STRESS-STRAIN BEHAVIOR OF SHUNGITE PARTICLE-FILLED RUBBERS	261
<i>A. V. Babaytsev, Yu. V. Kornev, &amp; N. A. Semenov</i>	
DEVELOPMENT OF MULTILEVEL MODELS BASED ON CRYSTAL PLASTICITY: DESCRIPTION OF GRAIN BOUNDARY SLIDING AND EVOLUTION OF GRAIN STRUCTURE	281
<i>A. I. Shveykin &amp; E. R. Sharifullina</i>	
EVALUATION OF ENERGY EFFICIENCY OF THE ALUMINOTHERMIC PROCESS OF PRODUCING METAL COMPOSITE MATERIALS BY THE CRITERIA OF THE MAXIMUM SELF-HEATING TEMPERATURE AND THE AGGREGATE STATE OF OXYGEN EXCHANGE REACTION PRODUCTS	299
<i>Yu. A. Abuzin, M. M. Karashaev, &amp; R. A. Sokolov</i>	
SYNTHESIS OF MICRO- AND NANOSIZED BIORESORBING SILICON-SUBSTITUTED TRICALCIUM PHOSPHATES FOR BONE TISSUE ENGINEERING AND THEIR BIOLOGICAL SAFETY USING MESENCHYMAL STEM CELLS	305
<i>I. V. Fadeeva, Ya. Yu. Filippov, A. S. Fomin, M. E. Shaposhnikov, G. A. Davydova, O. S. Antonova, I. I. Selezneva, A. Yu. Mikheev, L. I. Akhmetov, S. M. Barinov, E. I. Zaraiskii, &amp; R. A. Poltavtseva</i>	

INTENSIFICATION OF MASS TRANSFER IN LAMINAR  
AND TURBULENT CHANNEL FLOWS BY APPLYING SUBMICRON  
CAVITIES ON THE CHANNEL WALL SURFACE

319

*V. A. Aleksin & A. A. Markov*

2015 INDEX

335

338

**NANOMECHANICS SCIENCE & TECHNOLOGY**  
**An International Journal**

**VOLUME 6 AUTHORS**

**A**

- Abuzin, Yu. A., 299  
Afanasiev, A. V., 251  
Akhmetov, L. I., 305  
Aleksin, V. A., 319  
Antonova, O. S., 305  
Artemiev, A. V., 251  
Aygubova, A. Ch., 203

**B**

- Babaytsev, A. V., 261  
Balakirev, E. V., 57  
Barinov, S. M., 305  
Barmin, A. A., 17  
Battista, A., 161  
Belov, P. A., 1, 65  
Boykov, A. A., 87

**C**

- Cardillo, Christian, 161  
Chitra, S. R., 99  
Cuomo, M., 135

**D**

- Danilov, V. L., 223  
Davydova, G. A., 305  
Dolgov, N. A., 117  
Del Vescovo, Dionisio, 161

**F**

- Fadeeva, I. V., 305  
Fagone, M., 135  
Fedorov, A. V., 31

- Filippov, Ya. Yu., 305  
Fomin, A. S., 305  
Frolenkova, L. Yu., 117

**G**

- Getmanov, A. G., 193  
Gulbin, V. N., 87

**H**

- Hobosyan, M. A., 209

**K**

- Kakhramanov, R. M., 47  
Karashaev, M. M., 299  
Karnet, Yu. N., 203  
Kharchenko, K. D., 1  
Kolebina, N. V., 223  
Kornev, Yu. V., 193, 261  
Kosolapov, D. V., 57  
Kozlov, G. V., 203  
Kukudzhanov, K. V., 233  
Kurbatkina, E. I., 57

**L**

- Lavruk, S. A., 31  
Levitin, A. L., 233  
Lin, Jo Aung, 251  
Lurie, S. A., 1, 17, 65

**M**

- Magomedov, G. M., 203  
Markov, A. A., 209, 319  
Martirosov, M. I., 193**V20**

Martirosyan, K. S., 209

Mikheev, A. Yu., 305

**P**

Poltavtseva, R. A., 305

Polyansky, M. N., 17

**Q**

Qi, C., 65

**R**

Rabinskii, N. L., 47

Rabinskiy, L. N., 193, 251

Rizakhanov, R. N., 17

Rizzi, N. L., 161

Romashin, S. N., 117

Rudshtein, R. I., 17

**S**

Selezneva, I. I., 305

Semenov, N. A., 261

Shaposhnikov, M. E., 305

Sharifullina, E. R., 281

Shorkin, V. S., 117

Shulgin, A. V., 31

Shveykin, A. I., 281

Sokolov, R. A., 299

Solyaev, Yu. O., 17

Svistkov, A. L., 179

**T**

Tcherdyntsev, V. V., 87

Turco, E., 161

**U**

Uzhegova, N. I., 179

**Z**

Zaraiskii, E. I., 305

**NANOMECHANICS SCIENCE & TECHNOLOGY**  
**An International Journal**

**VOLUME 6 SUBJECTS**

- additive production, 47
- adhesive forces, 117
- aggregate state, 299
- Al–Si–C phase diagram, 57
- aluminothermic process, 299
- aluminum carbide, 57
- aluminum-matrix composite material, 57
- anisotropy, 135, 203
- atomic force microscopy, 179
- averaging methods, 261
- Berkovich indenter, 193
- biocompatibility, 305
- carbon combustion synthesis
  - of oxides (CCSO), 209
- carbon combustion, 209
- carbon fiber-reinforced plastic, 251
- carbon nanotubes (nanofilaments), 203
- cohesive interaction, 65
- composite materials, 299
- composite, 261
- composition investigation, 47
- contact interaction models, 179
- contact of elastic bodies, 117
- cracks arrest, 233
- creep, 223
- crystal plasticity, 281
- defect fields, 1
- deformation, 223
- dielectric strength, 99
- DMT model, 179
- electron microscopy, 47
- electroplasticity, 233
- electropulsing treatment, 233
- energy-dispersive microscopy, 47
- epoxy binder, 251
- epoxy–polyester coating, 193
- evaporation, 233
- ferrofluids, 99
- fields of conserved dislocations, 65
- finite deformation elastoplasticity, 135
- force-distance curve, 179
- frequency shift, 161
- fullerene soot, 251
- functional materials, 1
- gradient models, 17
- gradient theories of elasticity, 65
- gradient theory of elasticity, 1
- grain boundary sliding, 281
- grain fragmentation and breaking, 281
- grain structure changing, 281
- hardness, 193
- healing of microcracks, 233
- heat capacity, 31
- heat conductivity, 31
- Hertz model, 179
- high-energy electromagnetic
  - fields, 233
- hyperelastic material, 273
- intense thermal effects, 17
- interaction of microdefects, 233
- interfacial layer, 261
- JKR model, 179~

jumps of temperature  
and concentrations, 209

layered composite materials, 17

layered composite, 251

Lennard-Jones potential, 117

linear theory of elasticity, 117

localization, 233

low-carbon martensitic steel, 223

mass transfer enhancement, 319

Maugis–Dugdale potential, 117

maximum self-heating temperatures, 299

mechanical characteristics, 193

mechanical properties of material, 179

mechanical properties, 251, 261

mechanics of defective media, 65

melting, 31, 233

metal–ceramic high-temperature  
composites, 17

modal analysis, 161

modeling, 1, 261

modulus of elasticity, 1, 193

molecular dynamics, 31

multilevel models, 281

nanocomposite, 179, 203

nanojunctions, 261

nanoindentation, 193

nanomechanics, 65

nanoparticles, 31, 99

nanostructured materials, 17

nonclassical elastic characteristics, 65

optimization of structural  
parameters, 17

pantographic sheets, 161

phase transformations, 233

photopolymer, 47

potential energy, 117

potential force field, 117

powder paints, 193

power propulsion systems, 17

prediction of physical properties, 17

probe geometry, 179

reaction heat effect, 299

reduction of friction drag in pipes, 319

reinforcement degree, 203

ringshaped structures, 203

rubber, 261

samples with channels, 47

scale effects, 1

second-gradient continua, 161

shungite, 261

silicon carbide, 57

silicon, 57

silicon-substituted, 305

slip, 209, 319

spacecraft, 17

spherical indenter, 193

strength, 251

stress, 223

stress–strain state, 17

structural ceramics, 17

structural tensors, 135

structure investigation, 47

structure, 87

submicron-size tubes  
and pores, 209

surface forces, 117

tensile tests, 87

theory of interphase layer, 1

thermal conductivity, 87

thermal expansion, 87

thermally loaded units, 17

thermophysical and thermomechanical  
characteristics, 17

thermophysical computations, 299

tricalcium phosphate ceramics, 305

tubes and cavities  
of submicron scale, 319

tungsten boride, 87

viscosity, 99

XRD, 99