

Fourth Interdisciplinary Scientific Forum with International Participation on New Materials and Promising Technologies (NMPT-4)

IOP Conference Series: Materials Science and Engineering
Volume 525

Moscow, Russia
27 – 30 November 2018

ISBN: 978-1-5108-8817-3
ISSN: 1757-8981

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

This work is licensed under a Creative Commons Attribution 3.0 International Licence. Licence details:
<http://creativecommons.org/licenses/by/3.0/>.

No changes have been made to the content of these proceedings. There may be changes to pagination and minor adjustments for aesthetics.

Printed by Curran Associates, Inc. (2019)

For permission requests, please contact the Institute of Physics at the address below.

Institute of Physics
Dirac House, Temple Back
Bristol BS1 6BE UK

Phone: 44 1 17 929 7481
Fax: 44 1 17 920 0979

techtracking@iop.org

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2633
Email: curran@proceedings.com
Web: www.proceedings.com

Table of contents

Volume 525

Fourth interdisciplinary scientific forum with international participation "New materials and promising technologies"

27–30 November 2018, Moscow, Russian Federation

Accepted papers received: 1 April 2019

Preface

[Fourth interdisciplinary scientific forum with international participation "New materials and promising technologies"](#)

[Peer review statement](#)

Papers

[Effect of type of ceramic particles on efficiency of gas dynamic spraying and hardness of hybrid coatings AlMg6/C60](#)

A V Aborkin, A I Elkin, I A Evdokimov, N V Sachkova and A E Sytshev.....1

[Analysis of the atomic structure of the amorphous metal alloy Al₈₄Ni₆La₁₀](#)

K B Aleinikova, E N Zinchenko and A A Zmeikin.....6

[NMR studies of 3D topological insulators over a large temperature range](#)

A O Antonenko, E V Charnaya, V V Marchenkov and S V Naumov.....15

[The interaction of zirconium oxide nanoparticles with model binary and complex alloyed nickel alloys containing TiN](#)

S N Anuchkin, V A Volchenkova, E K Kazenas, N A Andreeva and T N Penkina.....21

[The hexahistidine containing organophosphorus hydrolase enzyme and bacterial cellulose based functional materials](#)

A G Aslanli, N A Stepanov, O V Senko, O V Maslova, I V Lyagin and E N Efremenko.....31

[Polypropylene composite material and its rheological and mechanical properties depending on the size of the filler \$CaCO_3\$](#)

E A Bilalova, E V Prut and O P Kuznetsova.....37

[Improved tetrathienoacene synthesis](#)

M S Skorotetcky, O V Borshchev and S A Ponomarenko.....42

[Structural–crystallographic and morphological properties of silicon composition of phosphate ore](#)

I A Pochitalkina and O V Vinokurova.....46

[Nonuniform polarized states of ferroelectric nanoparticles in a dielectric matrix](#)

V N Nechaev, A V Viskovatykh and A V Shuba.....52

[Development of heat- and wear-resistant nanocomposite copper powder based material and technique of its obtaining used for plungers of die-casting machines](#)

Y O Vladimirova and E P Shalunov.....62

[Influence of heat treatment on the magnetic properties of Fe-28%Cr-7%Co-2%Mo-0.5%Si powder hard magnetic alloy](#)

T A Vompe and I M Milyaev.....70

[Gold nanorods and a nanocomposite material based on them: analytical possibilities for spectrophotometric determination of total catecholamines](#)

M V Gorbunova, A O Shlenova, R V Klimenko, S V Gutorova, V V Apyari and S G Dmitrienko.....75

[Radiation nanotechnology for selective modifications of atomic composition and properties of thin film materials](#)

M M Dementyeva, K E Prikhodko, B A Gurovich, L V Kutuzov, B V Goncharov and D A Komarov.....85

[Effect of heat treatment on the structure and properties of the chromium-nickel alloy G-35](#)

V A Ermishkin, D L Mikhailov, S P Kulagin, N A Minina and N A Palyi.....91

[Identification of organic compounds using a multisensor detector based on SnO₂ films in gas chromatography](#)

I I Efimov and V G Povarov.....97

[Development of functional materials with specific activities for degradation of toxins](#)

E Efremenko, R Ahundov, A Aslanli, I Lyagin, O Senko, O Maslova and N Stepanov.....103

[The prospects for hydrothermal processing leucoxene concentrates for the production of synthetic wollastonite](#)

Y V Zablotskaya, G B Sadyhov, K. G Anisonyan and T V Olyunina.....109

[One-step hydrothermal surface oxidation of copper foil for photocatalytic water splitting](#)

D S Zimbovskii and A N Baranov.....113

[The electrochemical behavior of nanostructured binary systems based on transition metals](#)

N Ivanova, E Ivanova, A Lobanov, T Mikhailik, V Pugachev, Yu Zakharov and A Valnyukova.....119

[Technological features of receiving and research of high density ceramic materials on the basis of silicon carbide](#)

G D Kardashova and Sh Sh Shabanov.....126

[Composite oxide fibers and brittle matrix composites based on them](#)

V M Kiiko, A A Kolchin, S T Mileiko and N I Novokhatskaya.....131

[Synthesis and study of the properties of thermoset oligoimides with propargyl fragment](#)

T I Kolesnikov, A Y Tsegelskaya, M D Dutov, A M Orlova and A A Kuznetsov.....139

[Lignosulfonate, anionic surfactants and their mixtures influence on water solutions surface tension and zinc concentrate pressure leaching](#)

E B Kolmachikhina, E A Ryzhkova, D V Dmitrieva, V V Sviridov and S S Naboichenko.....147

[Influence of trehalose additives on the properties of poly\(vinyl alcohol\) cryogels formed in aqueous as well as in organic media](#)

O Yu Kolosova and V I Lozinsky.....153

[Influence of the content of n-butanol on the critical conversion of gel formation during "living" three-dimensional radical co-polymerization of styrene and divinylbenzene](#)

R I Komendant, E O Perepelitsina and S A Kurochkin.....159

[Change of the structural organization in the polar elastomer film under the action of electrostatic field](#)

N N Komova.....165

[Palladium complex of octaphenyl-substituted pyrazinoporphyrazine: synthesis, photochemical and photophysical properties](#)

A D Kosov, T V Dubinina and A N Volov.....175

[Synthesis of upconversion zirconia nanoparticles for bioimaging](#)

A Paramonova, G Kiselev, A Fakhardo, P Krivoschapkin and E Krivoschapkina.....183

[Development of the technology of obtaining the composite based on the "magnesium-bone substance" for biodegradable implants by the method of powder metallurgy](#)

P Kroklicheva, D Shornikov and M Savelyev.....191

[Study of electromagnetic characteristics of polymer materials based on single-walled and multi-walled carbon nanotubes](#)

G E Kuleshov and A V Badin.....201

[Outstanding problems of numerical simulation of the process of injection molding of PIM-feedstocks and component quality](#)

A A Kutsbakh, A N Muranov, A B Semenov and B I Semenov.....210

[Study of the interaction kinetics of apatite ore with nitric acid by independent analytical methods](#)

I A Poochitalkina, P H Le, T T Vu and I A Petropavlovskii.....216

[Molecular modelling of fullerene C₆₀ and its amino acid derivatives in aqueous medium](#)

V B Krapivin and V B Luzhkov.....222

[Effect of high-pressure treatment temperature on the structure of carbon phases formed from C₆₀ fullerenes under pressure](#)

I N Lukina, O P Chernogorova, E I Drozdova, V A Stupnikov and A V Soldatov.....228

[Effect of the sintering aids on optical and luminescence properties of Ce:YAG ceramics](#)

K E Lukyashin, A V Ishchenko, V A Shitov, V S Shevelev and L V Victorov.....234

[Carbazole-based donor-acceptor small molecules with hexyldicyanovinyl electron-withdrawing groups: synthesis and properties](#)

A N Solodukhin, Yu N Luponosov and S A Ponomarenko.....245

[Perspective approaches with the use of biocatalysts for improving the processes of polyaspartic acid production from oil benzene fraction after oxidative desulfurization](#)

O Maslova, O Senko, N Stepanov and E Efremenko.....252

[The high-temperature pseudo-invar effect in multilayer steel materials](#)

V E Kabantseva, M D Safonov and A I Plokhikh.....262

[Ultrasonication-assisted ultrafast solvothermal reduction of graphene oxide](#)

P A Mikhaylov, I S Levin, A V Lubenchenko, G N Bondarenko and V G Kulichihin.....267

[Laser writing of optical structures in quartz glass](#)

E S Oparin, K S Khorkov, D A Kochuev, R V Chkalov and A S Chernikov.....276

[Sorption of cesium by aluminosilicate sorbents from rice straw](#)

S B Yarusova, A E Panasenko, L A Zemnukhova, P S Gordienko, O D Arefieva and A A Narbutovich.....282

[Synthesis and electrochemical performance of Li-rich \$x\text{Li}_2\text{MnO}_3 \cdot \(1-x\)\text{LiMn}_{1/3}\text{Ni}_{1/3}\text{Co}_{1/3}\text{O}_2\$ \(\$x=0.2-0.5\$ \) cathode materials for lithium-ion batteries](#)

L S Pechen, E V Makhonina, A M Rumyantsev, Yu M Koshtyal, A S Goloveshkin, V V Volkov, Yu A Politov and I L Eremenko.....290

[Impact of UV treatment on polylactide–polyethylene film properties](#)

M V Podzorova, Yu V Tertyshnaya, S G Karpova and A Popov.....297

[Study of the energy band structure of \$\text{Lu}_2\text{SiO}_5:\text{Ce}^{3+}\$ single crystals by thermally stimulated luminescence method](#)

V A Tedzhetov, A V Podkopaev and A A Sysoev.....303

[Mechanical properties of multilayer materials](#)

A I Plokhikh, D V Vlasova, K B Polikevich and A A Minakov.....310

[Elaboration of aluminium based metalmatrix composite manufacturing](#)

E A Chernyshov, E A Romanova, A D Romanov, I D Romanov and V V Myl'nikov.....316

[Ultra-fast chip calorimetry accessories for in operando structural studies of nanogram-sized samples](#)

A A Rychkov, A P Melnikov, A I Rodygin, D V Anokhin, M Rosenthal and D A Ivanov.....322

[Ferro-gallium borate single crystals for nuclear resonance synchrotron experiments](#)

N Snegirev, Yu Mogilenec, K Seleznyova, I Nauhatsky, M Strugatsky, S Yagupov, A Kulikov, D Zolotov, N Marchenkov, K Frolov and I Lyubutin.....329

[Effect of tempering on microstructure and mechanical properties of a Ta-added 9%Cr steel with high B and low N contents](#)

E Tkachev and A Belyakov.....335

[Carboxymethylcellulose sodium salt – effective "green" reagent for management of calcium carbonate crystallization and nat-ural gas hydrate formation](#)

A V Fakhreeva, A I Voloshin, F F Musin, A G Telin and V A Dokichev.....344

[Investigation of multi-tip large area emitters using computerized field emission projector](#)

S V Filippov, A G Kolosko, R M Ryazanov, E P Kitsyuk and E O Popov.....352

[Laser synthesis of graphene in liquid nitrogen](#)

K S Khorkov, D A Kochuev, V A Ilin, V G Prokoshev and S M Arakelian.....361

[Sol-Gel synthesis of high-temperature aluminosilicate glass-ceramics and composite materials on its basis](#)

A S Chaynikova, N E Shchegoleva, S Y Modin, A A Akopian, D V Grashchenkov and M L Vaganova.....368

[RBa₂Cu₃O_Y crystal structure and properties](#)

L A Cherepanova, S G Titova and A V Fetisov.....374

[Investigation of viscosity of construction mixtures applied for 3D printing](#)

A V Sharanova, A D Panfilova, A A Plahtiy and M A Dmitrieva.....379

[Low-temperature cementation – perspective technology of hardening of toothed parts](#)

T V Shveyova and A I Shveyov.....385

[Nanometallobosilanes and organoelementoxanes as precursors of components of promising ceramic composites](#)

G I Shcherbakova, P A Storozhenko, T L Apukhtina, D V Zhigalov, M S Varfolomeev, A I Drachev and A A Ashmarin.....393

[The effect of polyvinylpyrrolidone nanowires on the metabolic activity of Lactobacillus acidophilus](#)

O Y Berezina, A V Vasilyeva, N A Sidorova, A I Savushkin and N P Marcova.....400

[Siliciding of carbon fabrics with gaseous SiO](#)

E I Istomina, P V Istomin, A V Nadutkin, V E Grass, M Y Presniakov, A S Lysenkov and M G Frolova.....406

[The structure of the alloy Ti - \(20-30\) Nb - 5Zr after smelting and homogenizing annealing](#)

S V Konushkin, M I Baskakova, A V Leonov, E O Nasakina, M A Sudarchikova, A A Kolmakova, A Bespamiatnova, K V Sergiyenko, Yu O Leonova and M A Sevostyanov.....412

[Effect of mixing duration and sintering temperature on the magnetic properties of hard magnetic powder alloy Fe-30Cr-8Co \(wt.%\)](#)

I M Milyaev, T A Vompe, M I Alymov, V S Yusupov, V A Zelenskii, A B Ankudinov and D M Abashev.....421

[Investigation of the surface layer thickness uniformity at the magnetron sputtering depending on the geometry of the flow](#)

E O Nasakina, M A Sudarchikova, G S Sprygin, M I Baskakova, I M Fedyuk, A Bospamiatnova, E A Danilova, S V Konushkin, A V Leonov, M A Sevostyanov and A G Kolmakov.....427

[Influence of various welding methods on the structure and properties of welded austenite steel joints with nitrogen content ~ 0,5%](#)

V S Kostina, M V Kostina and S O Muradian.....432

[The corrosion resistance investigation of the austenitic nitrogen Cr-Mn-Ni-Mo-N steel in the cast and deform state](#)

S O Muradyan, M V Kostina, V S Kostina and P Yu Polomoshnov.....438

[Some features of behavior of solid dielectrics under high pressure combined with shear stress](#)

I B Oparina and V V Schienok.....445

[Structure, hardness and fracture toughness of arc-melted LaB₆-TiB₂ eutectic alloy](#)

D D Nesmelov, S V Vikhman, E S Novoselov, S N Perevislov and S S Ordan'yan.....451

[Methods and techniques for producing ceramics from aluminum oxynitride](#)

D V Prosvirnin, A G Kolmakov, M D Larionov, M E Prutskov and A V Levina.....456

[Corrosive researches of nonnickel shape memory alloy](#)

M A Sevostyanov, M Losertova, E O Nasakina, O G Kuznetsova, A M Levin, A A Kirsankin, K V Sergiyenko, S V Konushkin, M I Baskakova, A V Leonov, M A Sudarchikova, I M Fedyuk, M A Kaplan, L A Shatova and A G Kolmakov.....465

[Investigation of amorphous alloys nanostructure and phase composition formed during integrated and split exposure of deformation and flash lamp annealing](#)

N D Bakhteeva, E V Todorova and S V Kannykin.....472

[The study of ceramic materials system SiC-YAG](#)

A M Tsareva, A V Leonov, M A Sevostyanov and A S Lysenkov.....477

[Synthesis of alumomagnesian spinel by mechanical activation method](#)

N A Popova, E S Lukin, L T Pavlyukova, M A Sevostyanov and A V Leonov.....481

[Reinforced composite materials based on silicon carbide and silicon nitride](#)

S N Perevislov, A S Lysenkov, D D Titov, M G Frolova and M.V. Tomkovich.....486

[Liquid-sintered SiC based materials with additive low oxide oxides](#)

S N Perevislov, A S Lysenkov, D D Titov, K A Kim, M V Tomkovich, D D Nesmelov and M A Markov.....491

[Materials based on boron carbide obtained by reaction sintering](#)

S N Perevislov, A S Lysenkov, D D Titov, M V Omkovich, D D Nesmelov and M A Markov.....496

[Properties of spherical stainless steel powders](#)

M A Kaplan, A A Kirsankin, M A Smirnov, T A Kalaida, E E Baranov, Yo O Ustinova and M A Sevostyanov.....500

[Investigation of the properties of heat-resistant spherical powders](#)

M A Smirnov, M A Kaplan, A A Kirsankin, T A Kalaida, E O Nasakina and M A Sevostyanov.....506

[Rheological properties of MoSi₂-NbSi₂ powders obtained by SHS-method and solid-phase mixture](#)

D D Titov, P A Miloserdov, A S Lysenkov, M G Frolova, E A Gumennikova and Yu F Kargin.....512

[Synthesis of Ti-Cr-C composite materials from CaCrO₄ based mixtures](#)

P A Miloserdov, V A Gorshkov, V I Yukhvid, O M Miloserdova, O A Golosova and D D Titov.....517

[Research of evaluation criteria quality control of the worked oil, charged into the main gearbox of «VR-14»](#)

D V Ratenko, I S Melnikova and A I Sergeev.....522

[Silicon nitride ceramics with light-melting sintering additive in CaO-TiO₂ system](#)

A S Lysenkov, S N Ivicheva, D D Titov, Yu F Kargin, K A Kim, M G Frolova, N V Petrakova, V G Leontiev, M V Tomkovich, S N Perevislov, I S Melnikova and K D Danilin.....528

[Transparent ceramic based on magnesium aluminate spinel for armor](#)

D O Lemeshev, M O Senina, M S Pedchenko and A V Boyko.....533

[Composite ceramics based on silicon carbide with layered location of reinforcing SiC fibers](#)

K A Kim, A S Lysenkov, D D Titov, Yu F Kargin, M G Frolova, A V Leonov, S N Perevislov, E I Istomina and D O Lemeshev.....540

[Synthesis the composites Si₃N₄-TiN by hot pressing](#)

Yu F Kargin, A S Lysenkov, K A Kim, A Yu Ivannikov, M G Frolova, D D Titov, S N Ivicheva, N A Ovsyannikov, A A Konovalov, S N Perevislov and N V Petrakova.....544

[Zol-gel synthesis of SiAlON materials dopped by rare-earth elements](#)

S N Ivicheva, A S Lysenkov, N A Ovsyannikov and Yu F Kargin.....548

[Silicon carbide ceramics reinforced SiC fibers](#)

M G Frolova, Yu F Kargin, A S Lysenkov, S N Perevislov, D D Titov, K A Kim, A V Leonov, E I Istomina, P V Istomin and M V Tomkovich.....552

[Tree etude problems on composite fuel gas tank](#)

A N Polilov, N A Tatus and O Yu Sklemina.....556

[Creation and application of fluoropolymer photoconversion films for greenhouses: Concept.](#)

S V Gudkov, A V Simakin, V E Ivanov, E V Barmina, I V Baimler, I I Rakov, L A Katicheva, V A Vodeneev and G A Shafeev.....563

[Electrochemical recycling of nickel-cobalt-containing tungsten alloys](#)

O G Kuznetsova, A M Levin, M A Sevostyanov and A O Bolshih.....569

[Biogas production from biomass of microalgae Chlorella vulgaris in the presence of benzothiophene sulfone](#)

O Senko, O Maslova, M Gladchenko, S Gaydamaka and E Efremenko.....576

[Biocatalytic transformation of various mycotoxins: modern problems and existing potential](#)

R Ahundov, I Lyagin, O Senko, O Maslova, T Makhlis and E Efremenko.....583

[Elastic properties of the plasma sprayed Ni coating after the electromechanical treatment](#)

A Yu Ivannikov, I N Lukina, V I Kalita, D I Komlev, A A Radyuk, N V Umnova, A S Baikin and A V Alpatov.....595

[Study of the coefficient of heat expansion of TiNbTaZr alloy](#)

K V Sergienko, D D Titov, S V Konushkin, A S Baikin, E O Nasakina, M I Baskakova, A Bospamiatnova, E E Baranov, L A Shatova, A G Kolmakov and M A Sevostyanov.....600

[Multifunctional nanomaterials based on ceria solid solution](#)

I V Zagaynov, S V Fedorov, I V Kulbakin and A A Klimashin.....607

[Water and water-ethanol mixtures \(alcoholic beverages\) viscosity measurements by dynamic light scattering with use of silica nanoparticles as a seed](#)

V N Kuryakov.....611

[Utilization of red mud and boron-containing liquid radioactive wastes of nuclear power plants](#)

M A Fedotov, D V Zinoveev, P I Grudinsky, L V Kovalenko and V G Dyubanov.....615

[Study of liquid-phase catalytic oxidation of natural renewable raw materials in alkaline media](#)

P A Sakharov, A V Khvatov, E V Koverzanova and S M Lomakin.....623

[Characteristic of zinc ferrite decomposition by calcium and magnesium oxides](#)

P I Grudinsky, A F Semenov, M A Sevostyanov and V G Dyubanov.....630

[Study of the effect of the introduction of heparin on the mechanical properties of polylactide](#)

M A Sevostyanov, A S Baikin, E O Nasakina, K V Sergienko, M A Kaplan, A V Leonov, A A Kolmakova, E A Danilova, L A Shatova, N P Leonova and A G Kolmakov.....637

[Study of the effects of the introduction of heparin on the mechanical properties of poly \(glycolide-dl-lactide\)](#)

A S Baikin, K V Sergienko, M A Kaplan, A V Leonov, A A Kolmakova, E A Danilova, L A Shatova, A M Tsareva, Yu O Leonova, Yu N Ustinova, A.P. Glinushkin and M A Sevostyanov.....643

[Study of polylactide degradation rate in a phosphate buffer solution](#)

A S Baikin, E O Nasakina, A M Tsareva, M A Kaplan, A A Kolmakova, E A Danilova, L A Shatova, N P Leonova, Yu O Leonova and A G Kolmakov.....649

[Calcium phosphate ceramic surface coating via precipitation approach](#)

N V Petrakova, E A Kuvshinova, A A Ashmarin, A A Konovalov, Y O Nikitina, A A Egorov, I K Sviridova, S M Barinov and V S Komlev.....654

[Effectiveness of the flame retardant antiseptic properties from plant waste against fungi on alnus glutinosa](#)

A P Glinushkin, E M Motasova, T P Aysuvakova, A V Ovsiankina, N S Zhemchuzhina, A M Mashenkov, A P Nesvat, O O Beloshapkina and N N Dubenok.....662

[Study of antiseptic properties of the flame retardant solution provided by oxidized plant waste with regard to wood staining and mold micromycetes](#)

A V Khvatov, P A Sakharov, S M Lomakin, S D Varfolomeev, Yu K Lukanina, A A Minikh, A P Glinushkin, L G Seraya and D V Demin.....669

[Oxo-degradation of LDPE with pro-oxidant additive](#)

Yu K Lukanina, N N Kolesnikova, A A Popov and A V Khvatov.....675

[Structural - chemical studies of the destruction of organochlorine compounds](#)

D V Demin, D Y Aladin, N F Deeva and S M Sevostyanov.....681