

2nd International Symposium on Fundamental Aspects of Rare-earth Elements Mining and Separation and Modern Materials Engineering (REES-2015)

IOP Conference Series: Materials Science and Engineering
Volume 112

Belokuriha, Russia
7 – 15 September 2015

Editors:

**Levon Tavady
Viktor Sachkov**

**Anna Godymchuk
Anna Bogdan**

ISBN: 978-1-5108-2087-6
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.

Copyright© (2015) by the Institute of Physics
All rights reserved. The material featured in this book is subject to
IOP copyright protection, unless otherwise indicated.

Printed by Curran Associates, Inc. (2016)

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: 845-758-2634
Email: curran@proceedings.com
Web: www.proceedings.com

Table of contents

Volume 112

2nd International Symposium on Fundamental Aspects of Rare-earth Elements Mining and Separation and Modern Materials Engineering (REES-2015)
7-15 September 2015, Altay, Russia

Accepted papers received: 29 December 2015
Published online: 18 February 2016

Preface
011001

[2nd International Symposium on Fundamental Aspects of Rare-earth Elements Mining and Separation and Modern Materials Engineering \(REES-2015\)](#) OPEN ACCESS Levon Tavadyan Prof, Viktor Sachkov Prof, Dr. Anna Godymchuk and Anna Bogdan

011002

[Peer review statement](#) OPEN ACCESS

Papers

012001

[Extraction of rare earth elements from hydrate-phosphate precipitates of apatite processing](#) OPEN ACCESS M O Andropov, A V Anufrieva, A S Buynovskiy, Y N Makaseev, I N Mazov, R A Nefedov, V I Sachkov, O B Stepanova and AV Valkov pg. 1

012002

[Rare earth elements materials production from apatite ores](#) OPEN ACCESS A V Anufrieva, O S Andrienko, A S Buynovskiy, Y N Makaseev, I N Mazov, R A Nefedov, V I Sachkov, O B Stepanova and A V Valkov pg. 5

012003

[Acoustoplasma Technique for Obtaining of Metal-Based Nanostructures](#) OPEN ACCESS N A Bulychev and M A Kazaryan pg. 11

012004

[The effects of liquid-phase oxidation of multiwall carbon nanotubes on their surface characteristics](#) OPEN ACCESS I N Burmistrov, D S Muratov, I A Ilinykh, E A Kolesnikov, A Yu Godymchuk and D V Kuznetsov pg. 18

012005

[Study of sulfur isotopes by vibrational spectroscopy and quantum chemistry](#) OPEN ACCESS O Kh Poleshchuk, N B Egorov, D V Akimov, I I Zherin and N A Zhuravlev pg. 22

012006

[Simulation of hydrogen adsorption on carbon nanotubes with different chirality parameters](#) OPEN ACCESS S V Gromov, I N Burmistrov, I A Ilinykh and D V Kuznetsov pg. 30

012007

[Spectrophotometric Procedure for Fast Reactor Advanced Coolant Manufacture Control](#) OPEN ACCESS O S Andrienko, N B Egorov, I I Zherin and D V Indyk pg. 38

012008

[The efficiency of rare elements used for hydrogen production from polymer waste](#) OPEN ACCESS S A Garelina, A L Gysev, R A Zakharyan, M A Kazaryan, G Martoyan, V I Sachkov and I N Feofanov pg. 43

012009

[Purification of rare-earth metals as the approach to improving properties of hard magnetic Nd₂Fe₁₄B-based materials](#) OPEN ACCESS N B Kolchugina, G S. Burkhanov, A G Dormidontov, A A Lukin, Yu S Koshkid'ko, K Skotnicova, H Drulis and B Smetana pg. 49

012010

[Corundum ceramic materials modified with silica nanopowders: structure and mechanical properties](#) OPEN ACCESS M. A. Kostytsyn, D. S. Muratov, D. V. Lysov, K. O. Chuprunov, A. G. Yudin and D. V. Leybo pg. 56

012011

[Energy effective approach for activation of metallurgical slag](#) OPEN ACCESS I N Mazov, B B Khaydarov, S L Mamulat, D S Suvorov, Y S Saltikova, A G Yudin and D V Kuznetsov pg. 61

012012

[Ultrasound-assisted synthesis of nanosized zero-valent iron for metal cations extraction and wastewater treatment applications](#) OPEN ACCESS I Yu Mikhailov, D V Lysov, V V Levina, I N Mazov, A A Gusev, T I Yuditseva and D V Kuznetsov pg. 65

012013

[Chromium-based catalyst for HFC-125 synthesis: promoters effect](#) OPEN ACCESS S I Reshetnikov, L G Simonova, A A Zirka and R V Petrov pg. 73

012014

[Separation of rare earth elements by zone recrystallization](#) OPEN ACCESS D V Akimov, A N Dyachenko, N B Egorov and N A Zhuravlev pg. 78

012015

[Surface layer composition of titania produced by various methods. The change of layer state under illumination](#) OPEN ACCESS V Zakharenko, E Daibova, N Kosova and O Zmeeva pg. 85

012016

[Nanostructured microtubes based on TiO₂ doped by Zr and Hf oxides with the anatase structure](#) OPEN ACCESS VV Zheleznov, EI Voit, YV Sushkov, SA Sarin, VG Kuryavyi, DP Opra, SV Gnedenkov, SL Sinebryukhov and AA Sokolov pg. 92

012017

[Investigation of supramolecular structure of the rare and rare-earth elements nanoparticles carrier when modified using microwave irradiation](#) OPEN ACCESS I A Lysak, G V Lysak, T D Malinovskaya and L N Skvortsova pg. 100

012018

[LiOH - H₂O₂ - H₂O trinary system study for the selection of optimal conditions of lithium peroxide synthesis](#) OPEN ACCESS R A Nefedov, Yu A Ferapontov and N P Kozlova pg. 106

012019

[Investigation of mechanical properties of masterbatches and composites with small additions of CNTs](#) OPEN ACCESS I N Burmistrov, T I Yudintseva, I A Ilinykh, B B Khaydarov, I N Mazov, S M Anshin and D V Kuznetsov pg. 114

012020

[Nanostructured SmFeO₃ electrophysical properties](#) OPEN ACCESS K G Abdulvakhidov, S N Kallaev, M A Kazaryan, P S Plyaka, S A Sadikov, M A Sirota and S V Zubkov pg. 118

012021

[The research of structure and mechanical properties of superhard electro-spark coatings for hardwearing mining tools](#) OPEN ACCESS P A Bajin, A P Chijikov, D V Leybo, K O Chuprunov, A G Yudin, M A Alymov and D V Kuznetsov pg. 123

012022

[Quantum chemical study of the structure and properties of isotopically pure lead chalcogenides](#) OPEN ACCESS O Kh Poleshchuk, N B Egorov, D V Akimov, I I Zherin and N A Zhuravlev pg. 128

012023

[Nucleation and crystallization behavior of RE - doped tellurite glasses](#) OPEN ACCESS V Goncharuk, A Mamaev, V Silant'ev, P Starodubtsev and I Maslennikova pg. 137

012024

[Hydrofluoride decomposition of natural materials including zirconium-containing minerals](#) OPEN ACCESS N Laptash and I Maslennikova pg. 142

012025

[Lead ferroniobat ceramic and films structures manufacture features and dielectric characteristic](#) OPEN ACCESS S H Alikhadjiev, M A Kazaryan, A V Pavlenko and P S Plyaka pg. 149

012026

[Experimental determination of energy transfer in Eu\(III\) complexes, based on pyrazole substituted 1, 3-diketones](#) OPEN ACCESS E A Varaksina, S A Ambrozevich, N P Datskevich, I V Taydakov and A G Vitukhnovsky pg. 154

012027

[Problem of the lithium peroxide thermal stability](#) OPEN ACCESS R A Nefedov, Yu A Ferapontov and N P Kozlova pg. 160

012028

[Estimation of the physico-chemical parameters of materials based on rare earth elements with the application of computational model](#) OPEN ACCESS K Mamaev, A Obkhodsky and A Popov pg. 166

012029

[Recent advances and future perspectives of nanosized zero-valent iron for extraction of heavy elements from metallurgical sludges](#) OPEN ACCESS I Yu Mikhailov, V V Levina, E A Kolesnikov, K O Chuprunov, A A Gusev, A Yu Godymchuk and D V Kuznetsov pg. 175

012030

[REM-containing silicate concentrates](#) OPEN ACCESS V F Pavlov, O V Shabanova, I V Pavlov, M V Pavlov and A V Shabanov pg. 181

012031

[Synthesis of micro-dispersed zirconium oxide for glass manufacturing](#) OPEN ACCESS V Goncharuk, P Starodubtsev and I Maslennikova pg. 187

012032

[Modification of Structural Phase State and Mechanical Properties of Poly-Grained Titanium Alloy Implanted by Aluminum Ions](#) OPEN ACCESS A V Nikonenko, N A Popova, E L Nikonenko, M P Kalashnikov and A Kurzina pg. 191

012033

[New technology of extracting the amount of rare earth metals from the red mud](#) OPEN ACCESS G A Martoyan, G G Karamyan and G A Vardan pg. 197

012034

[Titanium compounds as catalysts of higher alpha-olefin-based super-high-molecular polymers synthesis](#) OPEN ACCESS K B Konovalov, M A Kazaryan, V N Manzhay and O V Vetrova pg. 202

012035

[Prospects of lithium enrichment on \$^7\text{Li}\$ isotope by method of controlled ions electro-migration](#) OPEN ACCESS G A Martoyan, M M Kalugin, A V Gabrielyan and A G Martoyan pg. 206

012036

[Structure and phase composition of the superalloy on the basis of Ni-Al-Cr alloyed by Re and La](#) OPEN ACCESS E L Nikonenko, N A Popova, N A Koneva and E V Kozlov pg. 211

012037

[Effect of preparation conditions on physic-chemical properties of tin-doped nanocrystalline indium oxide](#) OPEN ACCESS T D Malinovskaya, V I Sachkov, V V Zhek and R A Nefedov pg. 216

012038

[Formation Structural Phase Gradients in Rail Steel During Long-Term Operation](#) OPEN ACCESS Yu F Ivanov, K V Morozov, O Peregodov, V E Gromov, N A Popova and E N Nikonenko pg. 222

012039

[The preparation of the Ti-Al alloys based on intermetallic phases](#) OPEN ACCESS N Kosova, V Sachkov, I Kurzina, A Pichugina, A Vladimirov, L Kazantseva and A Sachkova pg. 226

012040

[Study of rhenium production process by hydrogen reduction of rhenium hexafluoride](#) OPEN ACCESS V I Vybyvanets, A V Kosukhin, A V Cherenkov and G S Shilkin pg. 231

012041

[Investigation into Rhenium Fluorination Process](#) OPEN ACCESS V I Vybyvanets, A V Kosukhin, A V Cherenkov and G S Shilkin pg. 236

012042

[Production and investigation into properties of high-pure rhenium fluorides](#) OPEN ACCESS V I Vybyvanets, A V Kosukhin, A V Cherenkov and G S Shilkin pg. 243

012043

[Structural Transformations in heat resistant coatings containing rare earth elements](#)
OPEN ACCESS N I Afanasiev, O K Lepakova and N I Kosova pg. 249

012044

[Deformation and Damage Accumulation in a Ceramic Composite under Dynamic Loading](#) OPEN ACCESS M V Korobenkov, S N Kulkov, O B Naymark, U V Khorechko and A V Ruchina pg. 254

012045

[Self-propagating high-temperature synthesis of the high- current emission lanthanum and niobium contained ceramics](#) OPEN ACCESS O Yu Dolmatov, I V Shamanin and S S Chursin pg. 259