

# **18th International Scientific and Technical Conference Rapid Solidification Materials and Coatings (RSMC 2021)**

Journal of Physics: Conference Series Volume 2144

Moscow, Russia  
19-20 October 2021

ISBN: 978-1-7138-5115-8  
ISSN: 1742-6588

**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 with permission by Curran Associates, Inc. (2022)

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](mailto: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](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

# TABLE OF CONTENTS

Preface

Peer Review Statement

## **RAPID SOLIDIFICATION MATERIALS**

The control of the height and shape of the track in laser metal deposition by the QCW laser mode .....	1
<i>P S Rodin, V D Dubrov</i>	
Obtaining and plasma-electrolyte modification of fibers of ultralight magnesium alloy .....	6
<i>B L Krit, M M Serov, N V Morozova, Ruizhi Wu, V M Medvetskova</i>	
Peculiarities of calculations of formation of extended sections of steel castings in disposable moulds with functional coating of definite microrelief .....	11
<i>A F Smikov, S S Kuzovov, V S Moiseyev</i>	
Production and investigation of powders for additive synthesis from a new beta-solidifying TiAl-based alloy .....	15
<i>P V Panin, I A Bogachev, E A Lukina</i>	
Rheological properties of powder blend for extrusion of ceramic-polymer filament used in 3D printing .....	20
<i>A Smirnov, E V Kuznetsova, N N Babushkin, Y O Pristinskiy, N W Solis Pinargote</i>	

## **METHODS OF COATING APPLICATION AND RESEARCH**

Study of influence of micro-arc oxidation process duration on the characteristics of thermal control coatings for space applications .....	24
<i>K A Anikin, A V Apelfeld, I O Kondratskiy</i>	
Effect of nanocoating morphology on the signal of X-ray Photoelectron Spectroscopy .....	29
<i>V P Afanas'Ev, L G Lobanova, D N Selyakov, M A Semenov-Shefov</i>	
Investigation of propagation dynamics of material deformations caused by laser pulse action .....	34
<i>A F Banishev</i>	
Effect of TiN particles on mechanical and anticorrosive properties of oxide layers formed by PEO on silumin .....	38
<i>E D Borgardt, A V Katsman, M M Krishtal</i>	
Mechanical properties and corrosion resistance of Mg-RE cast alloys and their plasma electrolytic oxidation .....	44
<i>S V Zasyplin, A O Cheretaeva, M R Shafeyev, D L Merson, M M Krishtal</i>	
Residual stresses in surface layers and coatings .....	49
<i>A A Ashmarin, A A Lozovan, S Ya Betsofen, V S Moiseyev, E P Kubatina, M A Lebedev</i>	
Research of the influence of bias voltage on the structure and residual stress in Ta/W coatings applied on a copper substrate by inverted magnetron .....	53
<i>A A Lozovan, A S Lenkovets, N A Ivanov, T S Sukhova</i>	

## **LASER, ELECTRON-BEAM AND ION-PLASMA METHODS OF SURFACE MODIFICATION**

Optical fluxes propagation in the planar transport layer of multilayer coatings.....	58
<i>E V Egorov, V K Egorov</i>	
The applying of the short — term cross correlation in optical diagnostics of melt convection in laser metal deposition.....	64
<i>Y N Zavalov, A V Dubrov</i>	
Bioactive coatings on 3D printed titanium implants with a complex internal structure for bone replacement .....	69
<i>A I Kozelskaya, S Rutkowski, A S Gogolev, S G Chistyakov, I B Krasovsky, A A Zheravin, S I Tverdokhlebov</i>	
General principles for describing electronic and proton multiple scattering processes in solids.....	74
<i>V P Afanas'Ev, L G Lobanova, D N Selyakov, M A Semenov-Shefov</i>	
Electrochemical deposition of ceramic-like coatings on Ti-6Al-4V parts fabricated by electron beam melting .....	79
<i>N Y Peretyagin, I V Suminov, A Smirnov, N I Krikheli, O V Kramar, P Y Peretyagin</i>	
The effect of process current parameters on the properties of oxide layers under plasma electrolytic oxidation of AMg6 alloy .....	83
<i>A V Polunin, A G Denisova, A O Cheretaeva, M R Shafeev, E D Borgardt, I A Rastegaev, A V Katsman</i>	
Study of nanocomposite hafnia and zirconia based layers produced by plasma spraying.....	89
<i>S V Savushkina, A M Borisov, I V Suminov, E V Vysotina, A A Ashmarin</i>	
Regularities and features of acoustic emission under plasma electrolytic oxidation of wrought Al-Mg alloy .....	94
<i>I A Rastegaev, A V Polunin</i>	
Features of anodic plasma electrolytic treatment of an ultra-light alloy of the Mg-Li system in an aqueous electrolyte .....	100
<i>I V Tambovskiy, B L Krit, S A Kusmanov, A S Perkov, N V Morozova, V M Medvetskova, R A Vdovichenko, I R Palenov</i>	
Anomalous evolution of the ion-induced surface relief of highly oriented pyrolytic graphite.....	104
<i>N N Andrianova, A M Borisov, E S Mashkova, M A Ovchinnikov, V S Sevostyanova</i>	
Influence of argon ion irradiation dose on the formation of the surface layers composition and changing mechanical properties of ion-plasma coated carbon steel.....	109
<i>P V Bykov, V L Vorob'Ev, S G Bystrov, V V Tarasov, A Yu Drozdov, V Ya Bayankin, S S Alexandrova</i>	
Mechanical properties and fatigue of extruded D16 alloy profiles of the Al-Cu-Mg system after ion irradiation .....	114
<i>N V Gushchina, V V Ovchinnikov, K V Shalomov, D I Vichuzhanin</i>	
Arc-PVD coatings for titanium machining tool.....	117
<i>I V Blinkov, A P Demirov, D S Belov, A V Chernogor</i>	
The applying of layer-by-layer laser remelting in the technology of laser metal deposition.....	121
<i>Y N Zavalov, A V Dubrov</i>	

Cathodic boriding and anodic polishing of medium-carbon steel by plasma electrolysis .....	125
<i>S S Korableva, I R Palenov, I M Naumov, A A Smirnov, I A Kusmanova, I S Gorokhov, R D Belov, E V Sokova, K I Bestchetnikova</i>	
A comparative study of the effect of ions of different atomic masses on the magnetoresistive properties of Co <sub>90</sub> Fe <sub>10</sub> /Cu superlattices .....	129
<i>N V Gushchina, K V Shalomov, V V Ovchinnikov, N S Bannikova, R S Zavornitsyn, M A Milyaev</i>	
Development of a method for calculating the LTEC anisotropy of Zr alloys .....	132
<i>S Ya Betsofen, K A Speransky, A V Bespalov, S S Alexandrova</i>	
Plasma and photon technologies against bio-factors, dangerous to human being .....	137
<i>O D Volpian, R V Dronsky, Yu A Obod, A I Kuzmichev, O V Andrienko, K V Alybin</i>	
Evaluation of tribotechnical properties of modified surfaces after plasma electrolytic treatment.....	141
<i>T L Mukhacheva, T M Kalinina, S A Kusmanov</i>	
Temperature distribution in a cylindrical lengthy workpiece under plasma electrolytic heating .....	145
<i>S Yu Shadrin, A V Zhiron, T L Mukhacheva</i>	
Cathodic nitriding and anodic polishing of Ti6Al4V alloy by plasma electrolysis.....	150
<i>I V Tambovskiy, R A Vdovichenko, R D Belov, A D Dyakonova, R V Nikiforov, S A Silkin, I A Kusmanova</i>	

### **COMPOSITE MATERIALS AND PERMANENT JOINTS**

Diffusion welding in gradient heatmetry .....	155
<i>O A Barabanova, S Z Sapozhnikov, P A Salmin, S V Nabatchikov</i>	
Possible nature of electrical conductivity of the corund-graphene composite.....	160
<i>A G Zholnin, R S Hafizov</i>	
Development of technological processes for production of items from composite materials based on criterion system .....	164
<i>V I Galkin, A R Paltievich, E V Galkin</i>	

### **WORKS OF YOUNG SCIENTISTS**

Electrolytic superconducting niobium coatings for a cryogyroscope rotor: creation and properties.....	169
<i>M A Okunev, A R Dubrovskiy, O V Makarova, S A Kuznetsov</i>	

### **Author Index**