

# **7th International Conference on Nanomaterials by Severe Plastic Deformation 2017 (NanoSPD7)**

IOP Conference Series: Materials Science and Engineering  
Volume 194

Sydney, Australia  
2 – 7 July 2017

## **Editors:**

**Yuri Estrin**  
**Xiaozhou Liao**

ISBN: 978-1-5108-4029-4  
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© (2017) 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. (2017)

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

## Volume 194

**7th International Conference on Nanomaterials by Severe Plastic Deformation  
2–7 July 2017, Sydney, Australia**

**Accepted papers received: 24 April 2017  
Published online: 8 May 2017**

### **Preface**

011001

OPEN ACCESS

[7th International Conference on Nanomaterials by Severe Plastic Deformation](#)

X Z Liao and Y Estrin

011002

OPEN ACCESS

[Peer review statement](#)

### **Papers**

012001

OPEN ACCESS

[The 7th International Conference on Nanomaterials by Severe Plastic Deformation: a report of the International NanoSPD Steering Committee](#)

R Z Valiev and T G Langdon.....1

012002

OPEN ACCESS

[Fabrication of hybrid metal systems through the application of high-pressure torsion](#)

Megumi Kawasaki, Dae-Kuen Han, Jae-Kyung Han, Jae-il Jang and Terence G Langdon.....11

012003

OPEN ACCESS

[Characterization of UFG materials by X-ray and Neutron diffraction](#)

T Ungár and G Ribárik.....19

012004

OPEN ACCESS

[Strength, corrosion resistance, and biocompatibility of ultrafine-grained Mg alloys after different modes of severe plastic deformation](#)

S V Dobatkin, E A Lukyanova, N S Martynenko, N Yu Anisimova, M V Kiselevskiy, M V Gorshenkov, N Yu Yurchenko, G I Raab, V S Yusupov, N Birbilis, G A Salishchev and Y Z Estrin.....27

012005

OPEN ACCESS

[Scientific and Technological Foundations for Scaling Production of Nanostructured Metals](#)

Terry C. Lowe, Casey F. Davis, Peter M. Rovira, Mathew L. Hayne, Gordon S. Campbell, Joel E. Grzenia, Paige J. Stock, Rilee C. Meagher and Henry J. Rack.....35

012006

OPEN ACCESS

[Tribological and Geometrical Analysis of the Friction Forces of Continuous Severe Plastic Deformation](#)

T Donič, B Hadzima and G Raab.....41

012007

OPEN ACCESS

[Improving hydro-formability of stainless steel tubes by tube channel pressing](#)

Y Kitano, M Yuasa, H Miyamoto, M H Farshidi and E Bagherpour.....47

012008

OPEN ACCESS

[Processing and characterization of Al-Al<sub>3</sub>Nb prepared by mechanical alloying and equal channel angular pressing](#)

P Chandran, A Zafari, E W Lui and K Xia.....53

012009

OPEN ACCESS

[Microstructure and mechanical properties of Al-1050 during incremental ECAP](#)

M Salamati, S Tamimi, S Moturu, G Sivaswamy, M Qarni and A Rosochowski.....58

012010

OPEN ACCESS

[Equal Channel Angular Pressing \(ECAP\) of hollow profiles made of titanium](#)

M Krystian, K Bryła, J Horky and B Mingler.....64

012011

OPEN ACCESS

[Microstructural and superficial modification in a Cu-Al-Be shape memory alloy due to superficial severe plastic deformation under sliding wear conditions](#)

C G Figueroa, F N Garcia-Castillo, V H Jacobo, J Cortés-Pérez and R Schouwenaars.....70

012012

OPEN ACCESS

[Thermal stability and mechanical properties of HPT-processed CP-Ti](#)

Y Huang, S Mortier, P H R Pereira, P Bazarnik, M Lewandowska and T G Langdon.....76

012013

OPEN ACCESS

[Thermal stability and superplastic behaviour of an Al-Mg-Sc alloy processed by ECAP and HPT at different temperatures](#)

P H R Pereira, Y Huang and T G Langdon.....82

012014

OPEN ACCESS

[Effect of severe plastic deformation on the structure and properties of Ni-Cu alloys](#)

V V Popov, A V Stolbobsky and E N Popova.....88

012015

OPEN ACCESS

[Dynamic strain aging precipitation of Mg<sub>17</sub>Al<sub>12</sub> in AZ80 magnesium alloy during multi-directional forging process](#)

Q F Zhu, G S Wang, X J Wang, F Z Liu, C Y Ban and J Z Cui.....94

012016

OPEN ACCESS

[Change of deformation mechanisms in ultrafine grained Mg-Zn-Zr-Ca alloy](#)

Ruixiao Zheng, Tilak Bhattacharjee, Akinobu Shibata, Taisuke Sasaki, Kazuhiro Hono and Nobuhiro Tsuji.....100

012017

OPEN ACCESS

[Hardening and thermal stability of a nanocrystalline CoCrFeNiMnTi<sub>0.1</sub> high-entropy alloy processed by high-pressure torsion](#)

H Shahmir, M Nili-Ahmadabadi, A Shafie and TG Langdon.....106

012018

OPEN ACCESS

[Effect of severe cold-rolling and annealing on microstructure and mechanical properties of AlCoCrFeNi<sub>2.1</sub> eutectic high entropy alloy](#)

I S Wani, T Bhattacharjee, S Sheikh, Y Lu, S Chatterjee, S Guo, P P Bhattacharjee and N Tsuji.....112

012019

OPEN ACCESS

[Temperature dependent structural evolution in nickel/carbon nanotube composites processed by high-pressure torsion](#)

Andreas Katzensteiner, Katherine Aristizabal, Sebastian Suarez, Reinhard Pippan and Andrea Bachmaier.....117

012020

OPEN ACCESS

[Characterization of microstructure and mechanical property of pure titanium with different Fe addition processed by severe plastic deformation and subsequent annealing](#)

Guanyu Deng, Tilak Bhattacharjee, Yan Chong, Ruixiao Zheng, Yu Bai, Akinobu Shibata and Nobuhiro Tsuji.....123

012021

OPEN ACCESS

[Ultra-fine grained microstructure of metastable beta Ti-15Mo alloy and its effects on the phase transformations](#)

K Václavová, J Stráský, P Zháňal, J Veselý, V Polyakova, I Semenova and M Janeček.....129

012022

OPEN ACCESS

[Structural stability of ultra-fine grained magnesium alloys processed by equal channel angular pressing](#)

M. Janeček, T. Krajňák, P. Minárik, J. Čížek, J. Stráská and J. Stráský.....135

012023

OPEN ACCESS

[Cryomilled and spark plasma sintered titanium: the evolution of microstructure](#)

Jiří Kozlík, Hanka Becker, Petr Harcuba, Josef Stráský and Milos Janeček.....141

012024

OPEN ACCESS

[Investigation of graded strengthened hyper-deformed surfaces by impact treatment: micro-percussion testing](#)

David Tumbajoy-Spinel, Sylvie Descartes, Jean-Michel Bergheau, Halim Al-Baida, Cécile Langlade and Guillaume Kermouche.....147

012025

OPEN ACCESS

[Effect of grain refinement on mechanical properties of martensitic steel](#)

R K Islamgaliev, M A Nikitina, A V Ganeev and M V Karavaeva.....153

012026

OPEN ACCESS

[Realizing Ultrafine Grained Steel by Simple Hot Deformation Using Dynamic Transformation and Subsequent Dynamic Recrystallization Mechanisms](#)

L Zhao, N Park, Y Tian, A Shibata and N Tsuji.....159

012027

OPEN ACCESS

[Microstructure, accumulated strain, and mechanical behavior of AA6061 Al alloy severely deformed at cryogenic temperatures](#)

D C Magalhães, A M Kliauga, M Ferrante and V L Sordi.....165

012028

OPEN ACCESS

[Microstructure and texture evolution during severe plastic deformation of CrMnFeCoNi high-entropy alloy](#)

W Skrotzki, A Pukenas, B Joni, E Odor, T Ungar, A Hohenwarter, R Pippan and E P George.....171

012029

OPEN ACCESS

[Deformation and recrystallization behavior of super high-purity niobium for SRF cavity](#)

Y Yamaguchi, H Doryo, M Yuasa, H Miyamoto and M Yamanaka.....177

012030

OPEN ACCESS

[The effect of severe plastic deformation on the microstructure and mechanical properties of \(TiB+TiC\) reinforced titanium matrix composites](#)

W Lu, Y Han, J Xiang, J Li, J Mao and D Zhang.....183

012031

OPEN ACCESS

[Microstructures and hardness of stir zone for friction stir processed and post-processed heat treatment 7B04-O aluminium alloy](#)

Y Chen, H Ding and J Z Li.....189



012032

OPEN ACCESS

[High Strength and Wear Resistance of Tantalum by Ultrasonic Nanocrystalline Surface Modification Technique at High Temperatures](#)

A Amanov, Y S Pyun and V K Vasudevan.....195

012033

OPEN ACCESS

[Optimization of RT superplasticity of UFG Zn-22Al alloy by applying ECAP at different temperatures and phase regions](#)

M Demirtas, H Yanar and G Purcek.....201

012034

OPEN ACCESS

[Precipitates studies in ultrafine-grained Al alloys with enhanced strength and conductivity](#)

V.D. Sitdikov, M.Yu. Murashkin and R.Z. Valiev.....207

012035

OPEN ACCESS

[Enhanced fatigue properties of Ti-6Al-4V alloy turbine blades via formation of ultra-fine grained structure and ion implantation of surface](#)

I P Semenova, M K Smyslova, K S Selivanov, R R Valiev and Yu M Modina.....212

012036

OPEN ACCESS

[Optimized layer architecture for an extended fatigue life of ultrafine-grained AA1050/AA5005 laminated metal composites](#)

Frank Kümmel, Thea-Simone Tegtmeier, Heinz Werner Höppel and Mathias Göken.....218

012037

OPEN ACCESS

[Effect of stress relieving treatment on low cycle fatigue behavior of USSP treated 7075 aluminium alloy](#)

Vaibhav Pandey, K. Chattopadhyay, N. C. Santhi Srinivas and Vakil Singh.....224

012038

OPEN ACCESS

[Warm deformation behaviour of UFG CP-Titanium produced by I-ECAP](#)

Muhammad Jawad Qarni, Andrzej Rosochowski and Sonia Boczkal.....230

012039

OPEN ACCESS

[The effect of high-pressure torsion on the microstructure and properties of magnesium](#)

Roberto B Figueiredo, Shima Sabbaghianrad and Terence G Langdon.....236

012040

OPEN ACCESS

[The potential for achieving superplasticity in high-entropy alloys processed by severe plastic deformation](#)

Hamed Shahmir, Megumi Kawasaki and Terence G Langdon.....242

012041

OPEN ACCESS

[Superplasticity of nanostructured Ti-6Al-7Nb alloy with equiaxed and lamellar initial microstructures processed by High-Pressure Torsion](#)

Jorge M. Cubero-Sesin, Joaquin E. Gonzalez-Hernandez, Elena Ulate-Kolitsky, Kaveh Edalati and Zenji Horita.....248

012042

OPEN ACCESS

[Effect of equal-channel angular pressing on the mechanical behavior of a Bi-Sn eutectic alloy](#)

Fariba Naghdi, Roberto B Figueiredo and Terence G Langdon.....254

012043

OPEN ACCESS

[The effect of Cu-based core-sheath configurations on the processing of Nd-Fe-B-based permanent magnets via equal-channel angular pressing](#)

L Besley, H Zhang, A Molotnikov, H Kishimoto, A Kato, C Davies and K Suzuki.....260

012044

OPEN ACCESS

[3D modeling of unconstrained HPT process: role of strain gradient on high deformed microstructure formation](#)

A Ben Kaabar, A Aoufi, S Descartes and C Desrayaud.....266

012045

OPEN ACCESS

[High Pressure Torsion: from Laminar Flow to Turbulence](#)

R Kulagin, Y Beygelzimer, Y Ivanisenko, A Mazilkin and H Hahn.....272

012046

OPEN ACCESS

[Analytical and Experimental Investigation of Process Loads on Incremental Severe Plastic Deformation](#)

Mehmet Okan Görtan.....278

012047

OPEN ACCESS

[Experimental and numerical analysis of HPTE on mechanical properties of materials and strain distribution](#)

B Omranpour, R Kulagin, Y Ivanisenko and E Garcia Sanchez.....284

012048

OPEN ACCESS

[Multiscale Crystal Plasticity Modeling Considering Nucleation of Dislocations Based on Thermal Activation Process on Ultrafine-grained Aluminum](#)

Y Aoyagi.....290

012049

OPEN ACCESS

[Influence of subgrain boundaries on coarsening of grain structures](#)

D. Zöllner and W. Skrotzki.....296

012050

OPEN ACCESS

[Microstructure and mechanical characteristics of gradient structured Cu and Cu alloys processed by surface mechanical attrition treatment](#)

XZ Hu, LP Cheng, HL Chen, Z Yin, Z Zhang, BP Shu, YL Gong and XK Zhu.....302

012051

OPEN ACCESS

[Microstructural characteristics of nano-structured Fe-28.5Ni steel by means of severe plastic deformation](#)

S H Mousavi Anijdan, H R Jafarian and A Bahrami.....308

012052

OPEN ACCESS

[Structural stability of ultra-fine grained magnesium alloys processed by equal channel angular pressing](#)

M Janeček, T Krajňák, P Minárik, J Čížek, J Stráská and J Stráský.....314