

PREFACE

This book presents the proceedings of the 8th International Conference on Processing and Manufacturing of Advanced Materials – THERMEC'2013, which took place between December 2-6, 2013 in Las Vegas, USA, under the co-sponsorship of The Minerals, Metals & Materials Society (TMS), USA. The Conference was also under the international auspices of professional organizations from Japan, Korea, France, Italy, The Netherlands, Germany, Brazil, India, and Canada. The Conference was intended to bring together the researchers and engineers/technologists working in different aspects of processing, fabrication, structure/property evaluation and applications of both ferrous and nonferrous materials including biomaterials, and smart/intelligent materials as well as the advanced characterisation techniques. In addition to the contributed papers, the conference committee included in the final program the invited presentations by active researchers from various countries in several topic areas covered at THERMEC'2013.

Internationally known experts from several countries were invited to deliver Plenary/Keynote lectures at THERMEC'2013. Much of the credit for the success of the conference is due to the topic coordinators who have devoted their time, expertise and experience in promoting and in general co-ordination of the activities for the organization and efficient operation of the Conference. The coordinators of various session topics have devoted a considerable time and energy in soliciting papers from relevant researchers for presentation at the Conference. The Chairpersons of the different session played important role in conducting the proceedings of the session in a timely and efficient manner and the Committee expresses sincere appreciation for their involvement. The reviewers of the manuscripts, those who by tradition would remain anonymous, have been very helpful in efficiently reviewing the manuscripts, providing valuable comments well within the time allotted to them. The Editors express their sincere and grateful thanks to all reviewers.

Sincere thanks to over 32 students who received STUDENT GRANTS from USA Canada, Germany, France, UK, Belgium, UK, The Netherlands, Italy, Spain, Russia, Japan, Korea, PR China, Brazil and India and who assisted in monitoring various THERMEC sessions during Dec.2-6, 2013 at Rio Hotel. We express sincere thanks to number of organization such as DSI Inc, USA, Trans Tech Publishers and CBMM, Brazil for supporting student participation. Special thanks to ONR, USA for providing grants to 10 keynote and plenary speakers toward their participation at this Conference.

Finally, our sincere thanks to Ms Rachelle Razon and her staff at Origin Event Planning, USA for designing the Conference web page at short notice and assisting organizers in the preparation of the final Conference program and staging THERMEC'2013 in Las Vegas .

B. Mishra

Colorado School of Mines, USA

M. Ionescu

Australian Nuclear Science & Technology Organization, Australia

T. Chandra

University of Wollongong, Australia

General Chairmen

E. A. Holm, USA
M. Niinomi, Japan
D. Mantovani, Canada
Chong Soo Lee, Korea
T. Chandra, Australia

Program Chairmen

B. Mishra, USA
S. Takaki, Japan
F. Montheillet, France
K. U. Kainer, Germany
M. Ionescu, Australia

General Vice-Chairmen

K. Tsuzaki, Japan
R. Srinivasan, USA
C. Sommitsch, Austria
F. Rizzo, Brazil

International Advisory Committee

T. Chandra, Australia
K. Ameyama, Japan
R. A. N. Barbosa, Brazil
H. K. D. H. Bhadeshia, UK
W. Bleck, Germany
A. J. DeArdo, USA
J. T. M. De Hosson, The Netherlands
Maria Di Vona, Italy
L. Dobrzanski, Poland
C. Estornes, France
E. A. Holm, USA
N. Hort, Germany
Akihisa Inoue, Japan
M. Ionescu, Australia
K.U. Kainer, Germany
M. E. Kassner, USA
R. Kaibyshev, Russia
Y. Kawamura, Japan
C. Klinkenberg, Germany
P. Knauth, France
E. Kozeschnik, Austria
Ohjoon Kwon, Korea
T. G. Langdon, USA
Chong Soo Lee, Korea
Jai-Sung Lee, Korea
M. Niinomi, Japan
Dong Nyung Lee, Korea
M. Mahoney, USA
D. Mantovani, Canada
K. Marthinsen, Norway
K. Maruyama, Japan
S. Marya, France
D. Matlock, USA

Hugh J McQueen, Canada
F. Minami, Japan
B. Mishra, USA
R.S. Mishra, USA
R. Montanari, Italy
F. Montheillet, France
R. Narayan, USA
Yun Peng, PR China
Maria T. Perez-Prado, Spain
P. Prangnell, UK
D. Raabe, Germany
C. Ravindran, Canada
F. Rizzo, Brazil
J.M. Rodriguez-Ibabe, Spain
O. Ruano, Spain
Taku Sakai, Japan
Loredana Santo, Italy
D.B. Santos, Brazil
Chengjia Shang, PR China
S.C. Sharma, India
Leon L. Shaw, USA
O.D. Sherby, USA
W. Skrotzki, Germany
C. Sommitsch, Austria
R. Srinivasan, USA
R. Taillard, France
S. Takaki, Japan
K. Tsuzaki, Japan
R. Valiev, Russia
S. Vogel, USA
P. Wanjara, Canada
P. Withers, UK
Liang Zuo, PR China

Topics and Coordinators:

Al Alloys	K. Marthinsen, K. Matsuda, Tongguang Zhai, Liang Zuo
Mg Alloys (Prof Karl U. Kainer Symposium)	A. Luo, Norbert Hort, Y. Kawamura, Kwang Seon Shin, Xiaoqin Zeng
Ti Alloys/Aerospace Structural Metallic Materials	P. Wanjara, M. Takeyama, F. Montheillet, Nho-Kwang Park, C. Leyens
Steels (HSLA/AHSS/ IF/TRIP/HNS/Stainless)	S. Takaki, P. J. Jacques, D. Raabe, K. Tsuzaki, Sung Joon Kim, Jun Peng, J. M. Rodriguez-Ibabe, Chenjia Shang, D. B. Santos, D. Matlock
TMP Microalloyed Steels (Structure/Property Relationship) (Prof. A. J. DeArdo Symposium)	E. Poliak, Ohjoon Kwon, D. Bhattacharya, C. Klinkenberg,
High & Ultra High Temperature Materials (Intermetallics, Superalloys & Refractory Metals)	A. Wusatowska-Sarnek, M. Heilmaier, I. Charit, Tian, Sugui, Jong Taek Yeom
Advanced Materials in Biomedical & Bioengineering Applications	D. Mantovani, S. M. Mukhopadhyay, P. Kumta, M. Niinomi, F. Witte
Biomimetic Materials, Nanostructured Biomaterials & Biological Interactions	R. Narayan, Chikara Ohtsuki, M. Tatoulian, B. Nebe, S. Jayasinghe
Advanced Protective Coatings/Surface Engineering (Metallic, non-Metallic, Oxidation Resistant, Thermal Barrier, Refractory, Composites & Polymer Coatings)	A. Agarwal, A. Kobayashi, J. T. M. De Hosson, Chang-Jiu Li, Bongyoung Yoo
Composites (MMC, CMC)/ Nanocomposites/ Synthetic & Foams)	N. Gupta, G. Sasaki, R. Taillard, Soon Hyung Hong, Yuyuan Zhao
Interfaces & Grain Boundaries	M. Holcomb, C. Binck, S. Tsurekawa, W. Kleemann, Ying-Hao Chu
Fuel Cells, Hydrogen Storage Technologies, Batteries, Supercapacitors & Thermoelectric Materials	S. Bishop, T. Ishihara, P. Knauth, Ji-Cheng Zhao, Il Doo Kim
Friction Stir Processing/Welding	M. Mahoney, R. S. Mishra, P. Prangnell, S. V. Kailas
Materials Under Extreme Conditions (Radiation, High Strain Rate, Temperature, Pressure and Combinations)	S. Vogel, T. Sisneros, Yusheng Zhao, B. Winkler
Metallic Glasses/ Bulk Metallic Amorphous Materials	Y. Saotome, J. Schroers, J. Eckert, Hidemi Kato, Eun Soo Park, Guangyin Yuan
Nanomaterials for Structural & Energy Applications	L. L. Shaw, K. Ameyama, C. Estournes, M. Hiramatsu, Jai Sung Lee
Neutron Scattering & X-Ray Studies of Advanced Materials	K. D. Liss, B. Clausen, S. Harjo, M. Drakopoulos
Modelling & Simulation	H. K. D. H. Bhadeshia, Zi-Kui Liu, R. A. Lebensohn, Dong Woo Suh, E. Kozeschnik, Rongshen Qin
Materials Performance (Mechanical Behaviour, Damage, Fatigue, Fracture, Environmentally Assisted Fracture, Failure Analysis)	M. Sangid, F. Minami, A. Shyam, M. Zimmermann, D. Canadine
Smart/Intelligent Materials & Processes	K. Mizuuchi, J. M. Raulot, H. Hosoda, Loredana Santo, R. Vaidyanathan
Texture of Materials (Prof. G. Gottstein Symposium)	W. Skrotzki, T. Al-Samman, Dong Nyung Lee, Hirofumi Inoue
Ultra-Fine – Grained Materials (Prof. T. G. Langdon Symposium)	R. B. Figueiredo, N. Tsuji, Hyung Seop Kim, R. Z. Valiev, M. T. Perez-Prado
Welding & Joining of Advanced and Special Materials	A. Hirose, Todd A. Palmer, Chang Hee Lee, M. Brochu, M. J. M. Hermans

International Scientific Committee

G. Abbruzzese, Italy
Fujio Abe, Japan
A. Agarwal, USA
Koichi Akita, Japan
M. N. Avettand-Fenoel, France
S. A. Barnett, USA
M. Beppu, Brazil
D. Bhattacharya, USA
Bingzhe Bai, PR China
S. Bishop, Japan
J.J. Blandin, France
R. Bordia, USA
M. Brandt, Australia
H.P. Buchkremer, Germany
J.M. Cabrera, Spain
D. Canadinc, Turkey
A. Carrado, France
D. Chandra, USA
I. Charit, USA
B. Clausen, USA
D. A. Cortes Harnandez, Mexico
M. Demura, Japan
A. Deschamps, France
S. Dobatkin, Russia
A. D. Danikiewicz, Poland
J. Eckert, Germany
E. Essadiqi, Canada
S. Fare, Italy
D. Ferguson, USA
D.P. Field, USA
R. Figueiredo, Brazil
H. Fukutomi, Japan
T. Gloriant, France
N. Gupta, USA
M. Hasegawa, Japan
M. J. M. Hermans, Netherlands
K. Higashi, Japan
A. Hirose, Japan
P.D. Hodgson, Australia
M. Holcomb, USA
Jacob C. Huang, Taiwan
Xiaoxu Huang, Denmark
M. Ikeda, Japan
H. Inui, Japan
T. Ishihara, Japan
G. Itoh, Japan
Fujio Izumi, Japan
P. J. Jacques, Belgium
V. Jayaram, India
Zhengyi Jiang, Australia
Chang-Jiu Li, PR China
B.K. Jha, India
Y. Kagawa, Japan

M. Kambara, Japan
K.F. Karhausen, Germany
Hidemi Kato, Japan
Kyoko Kawagishi, Japan
Do Hyang Kim, Korea
Hyoung Seop Kim, Korea
W. Kleemann, Germany
S. Kobayashi, Japan
S. Kohara, Japan
Y. Kojima, Japan
J. Konrad, Germany
P. Kumta, USA
Hyun Kwang Seok, Korea
R. Lebensohn, USA
D. Leonard, France
C. Leyens, Germany
Saiyi Li, PR China
Meilin Liu, USA
K.D. Liss, Australia
N. Llorca-Isern, Spain
A. Lodini, France
R. Loge, France
B. Lopez, Spain
A. Luo, USA
F.D. S. Marquis, USA
S. Mathaudhu, USA
V. Massardier, France
J. Merker, Germany
M. Militzer, Canada
Eri Miura-Fujiwara, Japan
Hideshi Miura, Japan
Hiromi Miura, Japan
K. Mizuuchi, Japan
Koichi Momma, Japan
M. Muruganant, Australia
T. Nakano, Japan
B. Nebe, Germany
A.H. W. Ngan, Hong Kong
Hiromi Ngaumi, PR China
M. Niewczas, Canada
M. Oehring, Germany
Y. Ohgoe, Japan
S.C. Orimo, Japan
H. Palkowski, Germany
Todd A. Palmer, USA
P. Parasivamurthy, India
Eun-Soo Park, Korea
Nho-Kwang Park, Korea
Elena Pereloma, Australia
J. J. Pireaux, Belgium
E. Poliak, USA
D. Ponge, Germany
Marta Pozuelo, USA

Kamineni P. Rao, Hong Kong
J.M. Raulot, France
L. Rimondini, Italy
P. Rios, Brazil
E. Rivera-Munoz, Mexico
F. Roters, Germany
J. Saida, Japan
Yoshiyuki Saito, Japan
M. D. Sangid, USA
I. Samjdar, India
D.B. Santos, Brazil
Y. Saotome, Japan
T. Sasaki, Japan
Kwang-Seon Shin, Korea
A. Shyam, USA
J. Sietsma, The Netherlands
A. Simar, Belgium
M. Somani, Finland
A. Stamboulis, UK
N. Sugiura, Japan
Tian Sugui, PR China
Dong-Woo Suh, Korea
S. Suwas, India
Miyumi Suzuki, Japan
M. Szota, Poland
A. Tachibana, Japan
M. Taheri, USA
M. Takeyama, Japan
M..J. Tan, Singapore
M. Tatouljian, France
N. Thadhani, USA
W. Tillmann, Germany
Y. Tomota, Japan
C.Y.A. Tsao, Taiwan
N. Tsuji, Japan
S. Tsurekawa, Japan
Rie Umetsu, Japan
R. Vaidyanathan, USA
R.Z. Valiev, Russia
J.A.W. Dommelen, Netherlands
K. Verbeken, Belgium
N. Wanderka, Germany
Fuhui Wang, PR China
Yandong Wang, PR China
T. Webster, USA
A. Wusatowska-Sarnek, USA
Yoko Yambe-Mitarai, Japan
Jong Taek Yeom, Korea
Xiaoqin Zeng, PR China
Tongguang Zhai, USA
Yudong Zhang, France
Y. Y. Zhao, UK
M. Zimmermann, Germany

Co-Operating Organizations:

The Minerals, Metals, Materials Society (TMS), USA

ASM International, USA

The Iron & Steel Institute of Japan

The Japan Institute of Light Metals, Japan

The Society of Materials Science of Japan, Japan

The Japan Society for Technology for Plasticity, Japan

The Korean Institute of Metals & Materials (KIMM), Korea

The Metallurgy & Materials Society of CIM, Canada

Deutsche Gesellschaft fuer Materialkunde (DGM), Germany

Societe Francaise de Metallurgie et Materiaux (SF2M), France

Bond voor Materialenkennis, The Netherlands

Associazione Italiana di Metallurgia, Italy

Indian Institute of Metals, India

Associacao Brasileira de Metalurgia e Materiais, Brazil

Acknowledgements:

The THERMEC Committee expresses sincere thanks for all sponsors listed on website but especially ONR, USA for supporting student participation at THERMEC2013.