

TABLE OF CONTENTS

Magnesium Technology 2008

Editor & Organizer Information	xiii
--------------------------------------	------

Magnesium Technology 2008

Magnesium Plenary Session

Magnesium Front End Research and Development: A Canada-China-USA Collaboration	3
<i>Alan A. Luo, Eric Nyberg, Kumar Sadayappan, and Wenfang Shi</i>	

Primary Production

Electrodeposition of Magnesium from BaF ₂ -LiF-MgF ₂ Electrolyte	13
<i>Shaohua Yang, Zhaowen Wang, Bingliang Gao, Zhongning Shi, Ying Nie, Jidong Li, and Xianwei Hu</i>	
Preparation of Al-Mg Alloy from MgO through Molten Salt Electrolysis Method	17
<i>Shaohua Yang, Zhaowen Wang, Bingliang Gao, Zhongning Shi, Ying Nie, Jidong Li, and Xianwei Hu</i>	
The Application of a Back Propagation Artificial Neural Network Model in Mg Electrolysis Current Efficiency	21
<i>Bing Li, Jiangning Liu, Ze Sun, and Jianguo Yu</i>	
The Adverse Effects of MgO on Magnesium Electrolyte Properties and Improvement by Adding Lanthanum Chloride	25
<i>Bing Li, Jun Li, Jiangning Liu, and Jianguo Yu</i>	
Electrochemical Co-Deposition of Magnesium Base Alloys from Molten Salts	29
<i>Ninglei Sun, Jialin Ren, Hengyang Liu, and Hongmin Zhu</i>	
Magnesiothermic Reduction of Titanium Oxide Using the Solid Oxide Membrane Process	33
<i>Soobhankar Pati, Rachel DeLucas, Adam Powell, and Uday Bhanu Pal</i>	

Wrought Alloys I

Deformation Mechanisms of AZ31 Magnesium Alloy	41
<i>Timo Ebeling, Christian Hartig, Torsten Laser, and Rüdiger Bormann</i>	
Effect of Coiling on Hot Bulge Testing of AZ31 Magnesium Sheet	47
<i>Jon Carter</i>	
Finite Element Modeling of the Thermo-Mechanical Behavior of an AZ31 Magnesium Alloy during Hot Rolling	53
<i>Fady Elsayed, Hany Ahmed, Mary Wells, Gary Lockhart, and Daan Maijer</i>	
Investigating the Effect of Strain Rate and Temperature on the Deformability and Microstructure Evolution of AZ31 Magnesium Alloy	61
<i>Ismael Abdel Maksoud, Hany Ahmed, and Johannes Rödel</i>	
Mechanical Behavior of AZ31 Sheet Materials at Room and Elevated Temperature.....	69
<i>Jon Carter, Ravi Verma, and Paul Krajewski</i>	
Flow Stress Modelling of Magnesium AZ31 Alloy Based on High Strain Plane Strain Compression Data.....	75
<i>Rahul Bhattacharya, Brad Wynne, Mark Rainforth, and Bruce Davies</i>	
Analysis of Magnesium Alloy AZ31B-H24 for Ballistic Applications.....	81
<i>Tyrone Jones, Matthew Burkins, and William Gooch</i>	
Some Issues Relating to the Ductility of Wrought Magnesium Alloys.....	85
<i>Matthew Barnett, B. Arhatari, N. Stanford, A. Beer, Z. Keshavarz, and X. Ma</i>	

Thermodynamics and Phase Transformations

Elastic Constants of Magnesium Compounds from First-Principles Calculations.....	91
<i>Swetha Ganeshan, Hui Zhang, Shunli L Shang, Yi Wang, and Zi-Kui Liu</i>	
The Role of Solutes for Grain Refinement by (SiC)P: Experiment and Theoretical Calculation	95
<i>Robert Günther, Christian Hartig, Okechukwu Anopuo, Norbert Hort, and Rüdiger Bormann</i>	
Thermodynamic Database of Mg-Al-Ca-Sr: A Resource for Alloy Development and Improvement	101
<i>Hongbo Cao, Jun Zhu, Chuan Zhang, and Y. Chang</i>	
Thermodynamic Modeling of Porosity Formation during Non-Equilibrium Solidification in Magnesium Alloy Castings.....	105
<i>John Li, Jeff T. Wood, John Auld, and G. Wang</i>	

Local-Electrode Atom-Probe Tomographic Investigation of Strengthening Precipitates in a Mg-7Zn-3Al Alloy at Peak	113
<i>Shengjun Zhang, and Gregory Olson</i>	
A Comparative Examination of Aging and Creep Behavior of Die-Cast MRI230D and AXJ530	117
<i>Jessica TerBush, J. Wayne Jones, and Tresa Pollock</i>	
Effect of Pre-Aging on Age Hardening and Microstructure in Mg-Zn and Mg-Zn-Al Alloys	123
<i>Keiichiro Oh-ishi, Kazuhiro Hono, and Kwang Seon Shin</i>	
The Influence of Zn on the Precipitation Path in Mg-Sn Alloys	127
<i>Shaul Avraham, Alexander Katsman, Tomer Leviatan, Yael Maoz, and Menachem Bamberger</i>	
Age Hardening Response and Precipitate Microstructures of ZK60 Alloy Containing Trace Additions of Ag and Ca	133
<i>Chamini Mendis, Keiichiro Oh-ishi, and Kazuhiro Hono</i>	
 <u>Wrought Alloys II</u>	
Direct Chill Casting and Plastic Deformation of Magnesium Alloys.....	141
<i>Galia Harel, Mohamad El Mehtedi, Stefano Spigare Ili, Menachem Bamberger, Enrico Evangelista, Sandrine Sereni, and Gady Rosen</i>	
Effect of Reheating and Warm Rolling on Microstructure and Mechanical Properties of Twin Roll Strip Cast Mg-4.5Al-1.0Zn-0.4Mn-0.3Ca Alloy Sheet	147
<i>Suk Bong Kang, Hongmei Chen, Hyoung Wook Kim, and Jae Hyoung Cho</i>	
Texture Randomization of Magnesium Alloys Containing Rare Earth Elements	153
<i>Jeremy Senn, and Sean Agnew</i>	
Constitutive Behavior of Four Wrought Magnesium Alloys under Warm Forming Conditions	159
<i>Sean Agnew, Cyrus E. Dreyer, John F. Polesak III, William V. Chiu, C. John Neil, and Marcos Rodriguez</i>	
Microstructure and Bendability of AM60 and AZ61 Magnesium Alloy Tubes.....	165
<i>Yingxin Wang, Li Jin, Xiaoqin Zeng, Wenjiang Ding, Alan A. Luo, Anil K. Sachdev, and Raj Mishra</i>	
Study of Deformation Modes in AZ80 Magnesium Alloy	171
<i>Jayant Jain, Warren J. Poole, and Chad W. Sinclair</i>	

Development of a Strip-Rolling Technology for Mg Alloys Based on the Twin-Roll-Casting Process	177
<i>Rudolf Kawalla, Matthias Oswald, Christian Schmidt, Madlen Ullmann, Hans-Peter Vogt, and Nguyen Duc Cuong</i>	
The Flow Stress during Hot Compression Deformation of a Mg-Gd-Y-Zr Magnesium Alloy: Experiments and Numerical Simulations	183
<i>Xinping Zhang, and J. T. Wang</i>	
Weld-Seam Quality of Hollow Magnesium Alloy Extrusions	189
<i>Wim Sillekens, Daniël van der Linden, and Andrew den Bakker</i>	
 <u>Casting</u>	
Castability of Magnesium Alloys	197
<i>Shezad Saleem Khan, Norbert Hort, Ingo Steinbach, and Siegfried Schmauder</i>	
Characterization of AM60B Magnesium Castings Using a Counter Gravity (Hitchiner) Lost Foam Casting Process.....	203
<i>Kenneth Currie, Qingyou Han, Mohamed Abdelrahman, and Jim Droke</i>	
Grain Refinement and Grain Morphology Evolution in Magnesium Castings Investigated by Phase-Field Simulations.....	209
<i>Janin Eiken, Ingo Steinbach, G. Klaus, and A. Bührig-Polaczek</i>	
Mould Thermal Analysis in Direct-Chill Casting of Magnesium Alloys.....	215
<i>Dimitry Sediako, William MacDonald, and Stephen Hibbins</i>	
Strengthening of Cast Mg Alloys by Friction Stir Processing.....	221
<i>Taiki Morishige, Masato Tsujikawa, Sachio Oki, Tomotake Hirata, and Kenji Higashi</i>	
Further Improvements in HPDC Mg Alloys for Powertrain Applications	227
<i>Mark Gibson, Mark Easton, Vinay Tyagi, Morris Murray, and Gordon Dunlop</i>	
The Effect of Different Direct-Chill Casting Process on Microstructure, Macrosegregation and Mechanical Properties of F200mm AZ31 Billets	233
<i>Zhiqiang Zhang, Oichi Le, Shijie Guo, and Jianzhong Cui</i>	
Microstructure Refinement of AZ31B Alloys Processed with an Electromagnetic Vibration Technique	239
<i>Kenji Miwa, Mingjun Li, and Takuya Tamura</i>	

Wrought Alloys III

Anisotropy of the Damping Capacity of Rolled Mg-0.4Zn-0.6Zr (ZK01) Alloy	247
<i>Liming Peng, Lin Du, Li Jin, Oudong Wang, and Wenjiang Ding</i>	
Effect of Twinning on the Mechanical Behavior in Mg-Zn-Y Alloys	253
<i>Ju Youn Lee, Hyun Kyu Lim, Do Hyung Kim, Won Tae Kim, and Do Hyang Kim</i>	
Effect of {10-11} Contraction and {10-11}-{10-12} Double Twins on the Subsequent Deformation Behavior of Two Mg Alloys.....	257
<i>Lan Jiang, John J Jonas, and Raj Mishra</i>	
Effect of Pre-Ageing Treatment on Hot Compression Behavior of AZ31 Magnesium Alloy	263
<i>Lihong Shang, Stephen Yue, Elhachmi Essadiqi, Amjad Javaid, and Ravi Verma</i>	
Influence of Cerium on Texture and Ductility of Magnesium Alloy Extrusions	269
<i>Raja K. Mishra, Anil K. Gupta, P. Rama Rao, Anil K. Sachdev, Arun M. Kumar, and Alan A. Luo</i>	
Mechanical Properties and Microstructures of Extruded Mg-2.4at%Zn Alloys Containing Ag and Ca	275
<i>Chamini Mendis, Keiichiro Oh-ishi, Yoshiaki Kawamura, Tomoyuki Honma, Shigeharu Kamado, and Kazuhiro Hono</i>	
Forming Characteristics of Mg Sheet with Variation of Temperature	279
<i>Yong Nam Kwon, Young Seon Lee, and Jung Hwan Lee</i>	
The Influence of Calcium and Rare Earth Metals on the Microstructure and Mechanical Properties of Mg-3Al-1Zn during Extrusion	283
<i>Torsten Laser, Christian Hartig, Timo Ebeling, Marcus R. Nürnberg, Dietmar Letzig, and Rüdiger Bormann</i>	
Microstructures and Mechanical Properties of Magnesium Composite Alloys Dispersed with Carbon Nanotube via Powder Metallurgy Process	289
<i>Katsuyoshi Kondoh, Hiroyuki Fukuda, Hisashi Imai, and Bunshi Fugetsu</i>	

Advanced Magnesium Materials

Mg-6Zn/1.5%SiC Nanocomposites Fabricated by Ultrasonic Cavitation Based Solidification Processing	295
<i>Guoping Cao, Hongseok Choi, Juan Oportus, Hiromi Konishi, S. Kou, R. Lakes, and Xiaochun Li</i>	

Microstructure Evolution and Nucleation Kinetics of Rapidly Solidified Mg ₇ Zn _x Y(0.55Zr) Alloys.....	299
<i>Shijie Zhu, Shaokang Guan, Qing Yang, Mei Zhang, Xiaobo Bai, Liguo Wang, and Yufeng Sun</i>	
Synthesis-Structure Relationships in Cast Magnesium Periodic Cellular Materials	305
<i>Samson Ho, Lukas Bichler, Glenn Hibbard, and C. Ravindran</i>	
Symmetry Control during Thixoextrusion for AZ31 Mg Alloy	309
<i>Young Ok Yoon, and Shae K. Kim</i>	
The Behaviors of Second Phase and Hardness of Rheo-Die Cast AZ91D during Temperature Exposure	313
<i>Yongfeng Jiang, and Yefeng Bao</i>	
Fracture Toughness in Magnesium Alloys by Dispersion of Quasicrystalline Phase	317
<i>Hidetoshi Somekawa, Alok Singh, and Toshiji Mukai</i>	
<u>Alloy Microstructure and Properties</u>	
An Assessment of High Pressure Die Cast Mg-Zn-Al Alloys.....	323
<i>Mark Easton, Trevor Abbott, Jian-Feng Nie, and Gary Savage</i>	
Effect of Composition and Cooling Rate on the Beta Phase Formation in Mg-Al Alloys.....	329
<i>Suresh Sundarraj, Mridula Bharadwaj, and Shashank M. Tiwari</i>	
Effects of Composition on the Microstructure and Mechanical Properties of Mg-Al-Zn Alloys.....	331
<i>Songmao Liang, Yuequn Ma, Rongshi Chen, and Enhou Han</i>	
Phase Relations, Formation and Morphologies in Mg-Zn-RE (RE=Y, Rare Earth) Alloys.....	337
<i>Alok Singh</i>	
Microstructure Development and Mechanical Behavior in High Pressure Die Cast Magnesium-Aluminium Alloys	343
<i>A. V. Nagasekhar, Carlos Caceres, and Mark Easton</i>	
Stabilization of Mg-Ca-Zn Alloys by Zr Additons.....	347
<i>Dmitry Shepelev, Anton Gorny, Menahem Bamberger, and Alexander Katsman</i>	
The Effects of Alloying Elements on Microstructures and Mechanical Properties of Mg-MM (-Sn) Alloys.....	351
<i>Hyun Kyu Lim, Do Hyung Kim, Ju Youn Lee, Won Tae Kim, and Do Hyang Kim</i>	
A Study on the Microstructure of AS-Cast and Homogenized Mg-Gd-Nd-Zr Alloys.....	355
<i>Kaiyun Zheng, Jie Dong, Xiaoqin Zeng, and Wengjiang Ding</i>	

A Comparative Study on the Solution Treatment of Mg-Al and Mg-Al-Ca Alloys	361
<i>Lihong Han, Henry Hu, and Derek Northwood</i>	

Corrosion, Surface Finishing and Joining

Electrochemical Fabrication and Biocompatibility of the Hydroxyapatite Coating on Magnesium Alloy for Implanted Applications	367
<i>Shaokang Guan, Li Peng, Cuilian Wen, and Qun Luo</i>	

Gas Dynamic Spray (GDS) Coatings for Improving Galvanic Corrosion and Sliding Wear Resistance of Magnesium Alloys.....	373
<i>Jiaren Jiang, and Lijue Xue</i>	

The Microstructure and Performance of AZ31 Joint Welded by Gas Tungsten Arc	379
<i>Yefeng Bao, and Yongfeng Jiang</i>	

Influence of Cutting and Non-Cutting Processes on the Corrosion Behavior and the Mechanical Properties of Magnesium Alloys.....	383
<i>Martin Bosse, Petra Hoyer, Friedrich-Wilhelm Bach, and Dirk Bormann</i>	

Micro Galvanic Corrosion Behavior of Mg Alloys as a Function of Aluminum Content	389
<i>Mridula Bharadwaj, Shashank M. Tiwari, Yar-Ming Wang, and Vijayalakshmi Mani</i>	

Thread Forming in Magnesium Alloys.....	393
<i>Dirk Biermann, and Klaus Pantke</i>	

Creep Resistant Magnesium Alloys

Creep and Hot Working Behaviour of a New Magnesium Alloy Mg-3Sn-2Ca.....	401
<i>Norbert Hort, Kamineni P. Rao, Tarek Abu Leil, Hajo Dieringa, V.Y.R.K. Prasad, and Karl Ulrich Kainer</i>	

Neutron Diffraction Measurements of Residual Stresses in Creep-Resistant Magnesium Alloys.....	407
<i>Dimitry Sediako, and Michael Gharghouri</i>	

High Performance HPDC Alloys as Replacements for A380 Aluminum Alloy.....	411
<i>Boris Bronfin, Nir Moscovitch, V. Trostenetsky, G. Gerzberg, N. Nagar, and R. Yehuda</i>	

Microstructural Evolution and Creep Resistance in Mg-Sn-Ca Alloy	417
<i>Do Hyung Kim, Hyun Kyu Lim, Ju Youn Lee, Won Tae Kim, and Do Hyang Kim</i>	

Effect of Pressure Levels on Tensile Properties of Squeeze Cast Mg-Al-Sr Alloy.....	421
<i>Shuping Wang, Zhizhong Sun, and Henry Hu</i>	

The Mg-Al-Zn-Mn-Ca-Sr Alloy System: Backbone of Understanding Phase Formation in AXJ Alloys and Modifications of AZ and AM Alloys with Ca or Sr	427
<i>Andreas Janz, Joachim Groebner, and Rainer Schmid-Fetzer</i>	
Development of Creep Resistant Magnesium Die Casting Alloy RSM-9#.....	431
<i>Weijian Tao, Shu Wang, and Alfred Yu</i>	
A Comparative Study of the Microstructures and Creep Behavior of AE42 and AE44 Die-Casting Alloys.....	437
<i>Suming Zhu, Mark Gibson, Jian-Feng Nie, Mark Easton, and Per Bakke</i>	
Author Index	443
Subject Index	447