

Table of Contents

Preface, Inaugural, Memoriam, Organization and Committees

Chapter 1: Effect of Microgravity

ESA's Cooperative Strategy and Current Program in Materials Science in Space D. Voss	3
Columnar-to-Equiaxed Transition in Solidification Processing of AlSi7 Alloys in Microgravity the CETSOL Project G. Zimmermann, L. Sturz, B. Billia, N. Mangelinck-Noël, D.R. Liu, H. Nguyen Thi, N. Bergeon, C.A. Gandin, D.J. Browne, C. Beckermann, D. Tournet and A. Karma	12
Non-Equilibrium Processing of Ni-Si Alloys at High Undercooling and High Cooling Rates A.M. Mullis, L.G. Cao and R.F. Cochrane	22
<i>In Situ</i> Particle Layer Formation in a Al-Mn-Si Ternary Eutectic Alloy: Ground Reference and Microgravity Experiments B. Zhou and L. Froyen	28
Phase Field Modeling of β(Ti) Solidification in Ti-45at.%Al: Columnar Dendrite Growth at Various Gravity Levels A. Viardin, L. Sturz, M. Apel and U. Hecht	34
Formation of Intermetallic Phases in AlSi7Fe1 Alloy Processed Onboard the ISS G. Zimmermann, E. Schaberger-Zimmermann, S. Steinbach and L. Ratke	40
Modelling of Al-7%wtSi-1wt%Fe Ternary Alloy: Application to Space Experiments with a Rotating Magnetic Field O. Budenkova, F. Baltaretu, S. Steinbach, L. Ratke, A. Roósz, A. Rónaföldi, J. Kovács, A.M. Bianchi and Y. Fautrelle	46
Microgravity and Hypergravity Observations of Equiaxed Solidification of Al-Cu Alloys Using <i>In Situ</i> X-Radiography Recorded in Real-Time on Board a Parabolic Flight A.G. Murphy, J. Li, O. Janson, A. Verga and D.J. Browne	52
Influence of Iron Powder Addition on the Number of Primary Austenite Grains and Tensile Strength of Inoculated Cast Iron D. Kopyciński, E. Guzik, A. Szczęsny and J. Dorula	59

Chapter 2: Modelling of Solidification

A Numerical Study of the Influence of Pouring Technique on the As-Cast Structure of Al-Cu Ingots M. Ahmadein, M.H. Wu, P. Schumacher and A. Ludwig	67
Understanding Channel Segregates in Numerical Models of Alloy Solidification: A Case of Converge First and Ask Questions Later I. Vušanović and V.R. Voller	73
3D Meso-Scale Modeling of Solidification for Aluminum-Alloy Welding H.R. Zareie Rajani and A.B. Phillion	79
Numerical Study of the Influence of Diffusion-Governed Growth Kinetics of Ternary Alloy on Macrosegregation M.H. Wu, A. Kharicha and A. Ludwig	85
Using of the Averaged Voronoi Polyhedron for the Equiaxed Solidification Modeling A.A. Burbelko, J. Początek, D. Gurgul and M. Wróbel	91
Trapping Effect on the Kinetic Critical Radius in Nucleation and Growth Processes Z. Erdélyi, Z. Balogh, G.L. Katona and D.L. Beke	97
Thermo-Solutal Modelling of Microstructure Formation during Multiphase Alloy Solidification - a New Approach P.C. Bollada, A.M. Mullis and P.K. Jimack	103
Mushy Zone Resolidification in a Temperature Gradient in Multiphase and Multicomponent Alloys A. Löffler and M. Rettenmayr	109

Simulation of Dendritic Growth in Multicomponent Aluminium Alloys by Point Automata Method	
A.Z. Guštin and B. Šarler	115
Influence of Dendritic Morphology on the Calculation of Macrosegregation in Steel Ingot	
J. Li, M.H. Wu, A. Ludwig, A. Kharicha and P. Schumacher	121
Simulation of Liquid Film Migration during Melting	
M. Rettenmayr, O. Kashin and S. Lippmann	127
A Method to Estimate Interfacial Energy between Eutectic Solid Phases from the Results of Eutectic Solidification Experiments	
G. Kaptay	133
Modelling of the Density Changes of Nodular Cast Iron During Solidification by CA-FD Method	
A.A. Burbelko, D. Gurgul, W. Kapturkiewicz and E. Guzik	140
Control Volume Simulation of Casting Directional Solidification	
I. Budavari and D. Molnar	146

Chapter 3: Grain Refinement

Effect of Free Ti on Grain Refinement of Aluminium Inoculated with Potent TiB₂ Particles	
L. Zhou and Z.Y. Fan	155
Grain Refinement of Phosphorus Deoxidised Copper	
M.J. Balart, J.B. Patel and Z.Y. Fan	161
Interaction between Zr Addition and Intensive Melt Shearing on Grain Refinement of Commercial Purity Magnesium	
G.S. Peng, Y. Wang, M.X. Xia and Z.Y. Fan	167
Preparation and Characterization of Al-1Ti-3B Master Alloys by Salt Route and Evaluation of their Grain Refining Performance on Al-7Si Alloys	
V. Auradi and S.A. Kori	173
Addressing the Influence of Solute Diffusion Layer in Solidification Front in As-Cast Grain Size Prediction Models	
Y.J. Li and Q. Du	179
Prediction of As-Cast Grain Size of Inoculated Multicomponent Aluminum Alloys	
Q. Du and Y.J. Li	185

Chapter 4: Microstructure and Phase Evaluation

Columnar to Equiaxed Transition in Peritectic TiAl Based Alloy Studied by a Power-Down Technique	
J. Lapin, Z. Gabalcová, U. Hecht, R.P. Mooney and S. Mcfadden	193
Microstructure and Phase Evolution of Ni₂FeGa Heusler Alloy Extended to Different Degrees of Undercooling	
H. Nath and G. Phanikumar	199
Dynamic Coarsening of Austenite Dendrite in Lamellar Cast Iron Part 1 - Investigation Based on Interrupted Solidification	
A. Diószegi, R. Lora and V. Furlakidis	205
Dynamic Coarsening of Austenite Dendrite in Lamellar Cast Iron Part 2 - The Influence of Carbon Composition	
V. Furlakidis, R. Lora and A. Diószegi	211
Determination of Impurity Diffusion Coefficients in a Single Experimental Cycle	
H. Engelhardt and M. Rettenmayr	217
Eutectoid Transformation in Zn-Al Alloys Solidified by Rapid Cooling	
I. Peter, B. Varga and M. Rosso	223
Analysis of the Effect of Cooling Rate on Microstructure in 17% Cr Ferritic Cast Steel	
J. Parti and V. Mertinger	229
Design and Microstructure of Innovative Cobalt Base Alloy	
I. Peter, M. Rosso, D. Ioan, B. Ghiban and C. Castella	235

Effect of Composition and Wall Thickness on Mechanical Properties of High Pressure Die Castings J. Dúl and Z. Leskó	241
Simulation of Solidification and Convection of NH₄Cl-H₂O Solution in a Water-Cooled Copper Mold M. Ahmadein, M.H. Wu, M.S. Kharicha, A. Kharicha and A. Ludwig	247
Investigating the Foamability Decrease of Water-SiO₂ Suspension B.M. Somosvári and P. Bárczy	253
Liquidus and Solidus Temperature Calculation in Al-Cu-Fe System by ESTPHAD Method T. Mende, E. Tatárka, G. Kőrösy and A. Roósz	259
Liquidus Temperature Calculation in Sn-Bi-Cd System by ESTPHAD Method E. Tatárka, T. Mende and A. Roósz	265
Studying Pressure Induced Whiskers Formation from Sn-Rich Surfaces A. Sycheva, A. Radanyi and Z. Gácsi	271

Chapter 5: Continuous Casting

A Numerical Benchmark Test for Continuous Casting of Steel - II B. Šarler and R. Vrtnik	279
Microstructural Evaluation during Melt Conditioned Twin Roll Casting (MC-TRC) of Al-Mg Binary Alloys N.S. Barekar, S. Das, Z.Y. Fan, R. Cinderey and N. Champion	285
Solidification Mechanism of the Melt Conditioned Twin Roll Cast Magnesium Alloy S. Das, N.S. Barekar and Z.Y. Fan	291
Effect of Mushy Zone Permeability on the Formation of Centerline Segregation in Slab Casting M. Réger, B. Verő, R. Józsa and Z. Csepeli	296
On the Relationship between Inclusions and Pores, Part II: Dendritic Structure, Pressure Drop in the Liquid and Pore Precipitation A.S. Nick and H. Fredriksson	302

Chapter 6: *In Situ* Observation of Solidification Processes

Characterization of Motion of Dendrite Fragment by X-Ray Radiography on Earth and under Microgravity Environment G. Salloum-Abou-Jaoude, H. Nguyen-Thi, G. Reinhart, R.H. Mathiesen, G. Zimmermann and D. Voss	311
Recurring Instability of Cellular Growth in a Near Peritectic Transparent NPG-TRIS Alloy System A. Ludwig and J. Mogeritsch	317
<i>In Situ</i> Investigation of Grain Migration by TGZM during Solidification in a Temperature Gradient G. Reinhart, H. Nguyen-Thi, B. Sarpi, A.A. Bogno and B. Billia	323
Identification of Grain Boundary Segregation Mechanisms during Silicon Bi-Crystal Solidification A. Autruffe, J. Friis, L. Vines, L. Arnberg and M. di Sabatino	329
Three Dimensional Morphology of Mn Rich Intermetallics in AlSi Alloys Investigated with X-Ray Tomography P. Mikolajczak and L. Ratke	335

Chapter 7: Eutectic and Peritectic Solidification

Solidification of Bulk Lamellar Eutectics U. Hecht, V. Witusiewicz and S. Rex	343
Determination of the Origin of Anomalous Eutectic Structures from <i>In Situ</i> Observation of Recalescence Behaviour A.M. Mullis, C.R. Clopet and R.F. Cochrane	349

Microstructure Evolution in an Aluminum Cladded Sheet during Vacuum Brazing C. Bernardi, A. Hazotte, N. Siredey-Schwaller, T. Mazet and J. Lacaze	355
The Effect of Sulfur on the Contact Angle between Liquid Eutectic Fe-V-C Alloy and VC Substrate and on the Microstructure of the Alloy M. Boccalini Júnior and A.V. de Oliveira Corrêa	361
Evaluation of (Al)-Si Eutectic Reference Temperature of A3xx Alloys D. Ferdian and J. Lacaze	367

Chapter 8: Forced Convection, Melt Flow

Magnetic Fields, Convection and Solidification L. Hachani, J. Wang, I. Kaldre, G. Salloum-Abou-Jaoude, O. Budenkova, G. Reinhart, K. Zaidat, N. Mangelinck, X. Li, H. Nguyen Thi, A. Bojarevics, Z.M. Ren, L. Buligins and Y. Fautrelle	375
Flow Control during Solidification of AlSi-Alloys by Means of Tailored AC Magnetic Fields and the Impact on the Mechanical Properties D. Rábiger, B. Willers and S. Eckert	384
Simulation of Low Frequency Electromagnetic DC Casting N. Kosnik, R. Vertnik and B. Šarler	390
Influence of Crystal Morphological Parameters on the Solidification of ESR Ingot E. Karimi-Sibaki, A. Kharicha, J. Korp, M.H. Wu and A. Ludwig	396
Numerical Simulation of the RMF Stirring of Molten Ga-In Alloy Using RANS K-ϵ and LES Turbulence Models C. Nagy, Y. Fautrelle, O. Budenkova, A. Rónaföldi and A. Roósz	402
Unidirectional Solidification of Pb-Sn Alloys in a Rotating Magnetic Field J. Kovács, A. Rónaföldi and A. Roósz	408
The Effect of Rotating Magnetic Field on the Solidified Structure of Sn-Cd Peritectic Alloys M. Svéda, A. Sycheva, J. Kovács, A. Rónaföldi and A. Roósz	414
<i>In Situ</i> and Real-Time Analysis of TEM Forces Induced by a Permanent Magnetic Field during Solidification of Al-4wt%Cu H. Nguyen-Thi, J. Wang, G. Salloum-Abou-Jaoude, G. Reinhart, I. Kaldre, N. Mangelinck, Z.M. Ren, L. Buligins, A. Bojarevics, Y. Fautrelle, O. Budenkova and T. Lafford	420

Chapter 9: Cast Iron

On Factors Influencing Macro Shrinkage Porosity Formation in Compacted Graphite Iron S. Vazehrad, J. Elfsberg and A. Diószegi	429
A Possible Mechanism for the Formation of Exploded Graphite in Nodular Cast Irons R. Gerghu, L. Magnusson Åberg and J. Lacaze	435
Cast Iron Solidification Structure and how it is Related to Defect Formation L. Elmquist, K. Soivio and A. Diószegi	441
The Effect of Inoculation on the Thermal Expansion/Contraction during Solidification of Gray Cast Iron A.T. Tadesse and H. Fredriksson	447
Determining Temperature Dependencies of Sand Mould Thermal Properties P.K. Krajewski, G. Piwowarski and W.K. Krajewski	452
Graphite Growth Morphologies in Cast Iron H.M. Muhmond and H. Fredriksson	458
Analysis of the Antimony and Strontium Cross-Effects in Al-Si Foundry Alloys M. Tokár, G. Fegyverneki and V. Mertinger	464

Chapter 10: Rapid Solidification

Designing Amorphous/Crystalline Composites by Liquid-Liquid Phase Separation D. Janovszky and K. Tomolya	473
Formation of the Surface Layer with Improved Tribological Properties on Austenitic Stainless Steel by Alloying with REE Using HIPPB B. Sartowska, M. Barlak, L. Waliś, J. Senatorski and W. Starosta	479

Concentration Dependent Growth Velocities in Undercooled Al-Rich Al-Ni Alloy Systems G.J. Ehlen, H.F. Wang and D.M. Herlach	485
Characterization of the Solidifying Microstructure in $\text{Ti}_{60}(\text{Ni}_x\text{Cu}_{40-x})_{40}$ Alloys V. Rontó, A. Sycheva, J. Sólyom, P. Pekker, I. Cora and É. Fazakas	491
Microstructure Evolution and Mechanical Properties of Suction Cast $\text{Ti}_{60}\text{Fe}_{40-x}\text{Co}_x$ ($x = 0, 16, 18, 20, 22, 24$) Alloys S. Samal, P. Gautam, S. Agarwal and K. Biswas	497
Mechanical Behavior of Novel Suction Cast Ti-Cu-Fe-Co-Ni High Entropy Alloys S. Samal, S. Mohanty, A.K. Misra, K. Biswas and B. Govind	503
Amorphization of CuZr Based Alloy Powders by Mechanical Milling K. Tomolya, D. Janovszky and A. Sycheva	509
<i>In Situ</i> Al_3Nb Formation in Liquid Al by Nb Particle Addition S. Kumar, S. Agarwal and K. O'Reilly	515