

## Program

# ***Modeling of Casting, Welding and Advanced Solidification Processes X***

May 25-30, 2003

Sandestin Resort & Conference Center  
Destin, Florida  
Tel: 1-850-267-8000 - Fax: 1-850-267-8222

### **Conference Chair**

**Doru Stefanescu**  
University of Alabama

### **Conference Co-Chairs**

**James Warren**  
NIST

**Mark Jolly**  
University of Birmingham

**Matthew Krane**  
Purdue University

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Sunday, May 25, 2003

16:00 – 18:30	Registration
18:00 – 18:30	Welcome Reception
18:30 – 21:00	Dinner
21:00 – 22:00	Opening Reception

Monday, May 26, 2003

07:00 – 09:00	Breakfast
09:00 – 09:30	Conference Welcome and Overview <i>Doru Stefanescu</i> , University of Alabama, Conference Chair <i>Fred Landis</i> , Conferences Committee, ECI
<b><u>SESSION I: Phase Field Modeling</u></b>	
09:30 – 10:10	<b><u>Keynote Talk</u></b> <i>A. Karma</i> Quantitative Phase Field Modeling of Solidification Microstructures
10:10 – 10:30	Coffee Break
10:30 – 10:50	<i>D.J. Lewis, W.J. Boettinger, J.A. Warren</i> Three Dimensional Phase Field Modeling of Binary Eutectics (094)
10:50 – 11:10	<i>J.A. Dantzig, J.H. Jeong, N. Goldenfeld</i> Dendritic Growth with Fluid Flow in Pure Materials (081)
11:10 – 11:30	<i>N. Warnken, B. Bottger, Suzana B. Fries, I. Steinbach</i> Multiphase-Field Model for Multicomponent Alloy Coupled to Thermodynamic Database (038)
11:30 – 11:50	<i>H. Diepers, J. Eiken, I. Steinbach</i> The Effect of Thermodynamics and Kinetics on the Dendritic Structure in Ternary Fe-C-Mn (042)
11:50 – 12:00	Discussion
12:00 – 13:30	Lunch
13:30 – 13:50	<i>M. Apel, B. Bottger, I. Steinbach</i> Phase-Field Simulation of Microstructure Formation during Directional Solidification of Ternary Eutectic Alloy (037)
13:50 – 14:10	<i>M. Rappaz, J.-M. Drezet, P.-D. Grasso, A. Jacot</i> Hot Tearing and Coalescence: Two Deeply-Connected Phenomena (117)

Monday, May 26, 2003 (continued)

**SESSION II: Cellular Automaton Modeling**

14:10 – 14:30 *J.A. Spittle, S.G.R. Brown*  
A Micro-Model to Account for Hot Tearing Susceptibility in Al-Cu Alloys (065)

14:30 – 14:50 *W. Wang, P.D. Lee, M. McLean*  
Simulation of the History Dependence of Primary Dendrite Spacing in Directional Solidification (104)

14:50 – 17:40 *ad hoc* discussions, free time

17:40 – 18:00 afternoon coffee

18:00 – 18:40 **Keynote Talk**  
*C.P. Hong, M.F. Zhu*  
A Modified Cellular Automaton Model for the Prediction of Microstructure Evolution in Solidification of Alloys (057)

18:40 – 19:00 *L. Beltran-Sanchez, D.M. Stefanescu*  
A Fully Quantitative Mesh-Independent Cellular Automaton Model for Dendrite-Growth (109)

19:00 – 19:20 *I. Steinbach*  
Multiscale Modeling of Equiaxed Alloy Solidification (024)

19:20 – 19:30 Discussion

19:30 – 21:00 Dinner

21:00 **POSTER SESSION I/Social Hour**

*J.A. Warren, Irina Loginova, L. Granasy, T. Borzsonyi, T. Pusztai*  
Phase Field Modeling of Alloy Polycrystals (090)

*M. F. Zhu, C. P. Hong*  
Modeling of Microstructure Evolution in Eutectic and Peritectic Solidification (058)

*S. Raghavan, M.J.M. Krane, D. Johnson*  
Different Rule Sets for Cellular Automata Modeling of Peritectic Dendritic Growth (101)

*A.V. Catalina, D.M. Stefanescu, S. Sen*  
Numerical Calculation of the Morphology of a Solid/Liquid Interface near an Insoluble Particle (111)

*J. Z. Zhao, L. Ratke*  
Modeling of the Liquid-Liquid Decomposition in Rapidly Unidirectionally Solidified Al-Pb Alloys (004)

Monday, May 26, 2003 (continued)

*H. Cao, M. Wessén*

Modeling of Microstructure - Mechanical Property Relations in Cast Mg-Al Alloys (067)

*A. Ludwig, M. Wu, M. Fehlbier, C. Afrath, A. Bührig-Polaczek*

Study of the Rheology of Semisolid Alloys within a Capillary Viscometer (036)

*M. M'Hamdi, T. Magnusson, Ch. Pequet, L. Arnberg, M. Rappaz*

Modeling of Microporosity Formation during Directional Solidification of an Al-7%Si Alloy (047)

*D. Emadi, J. Gruzleski*

A Modeling Approach in Studying Porosity Formation in Sr-Modified Al-Si Alloys (103)

*B. Appolaire, H. Combeau*

Modeling of the Settling of Equiaxed Crystals during the Solidification of Large Steel Ingots (029)

*L. Thuinet, G. Lesoult, H. Combeau*

Computer Simulation of Microsegregation in the Case of Columnar Growth Involving a Peritectic Transformation for Multicomponent Steels (051)

*G. Quillet, A. Ciobanas, P. Lehmann, Y. Delannoy, M. Medina, Y. Fautrelle*

Modeling of the Mesosegregations in a Binary Alloy under the Influence of a Forced Convection (049)

*X. Kang, D. Li, T. Lu, P. Zhang, Y. Li*

Modeling the Effect of Natural Convection on Macrosegregation of Steel Ingot by Using a Novel Method (066)

*S. Le Corre, M. Bellet, F. Bay, Y. Chastel*

Two-Phase Approach for Solidification Problems: Modeling the Mushy Zone Deformation (088)

*J. Thorborg, J. Hattel*

Thermo-Elasto-Plasticity in Solidification Processes Using the Control Volume Method Applied on Staggered Grid (118)

*R.S. Ransing, W.K.S. Pao, R.W. Lewis*

Solidification and Thermal Stress Simulation Using Medial Objects (095)

*M. Chiumenti, M. Cervera, C. A. de Saracibar, Q. Valverde*

Numerical Simulation of Aluminum Foundry Processes (044)

*P.A. Nikrityuk, K. Eckert, R. Grundmann*

3D Two-Phase Modeling of PbSn Alloy Solidification in an External Magnetic Field (098)

Tuesday, May 27, 2003

7:00 – 9:00

Breakfast

**SESSION III: Deterministic Modeling of Microstructure**

9:00 – 9:20

*M. Wu, A. Ludwig, L. Ratke*

Modeling the Decomposition and Microstructure Evolution during Solidification of Hypermonotectic Alloys (035)

**SESSION IV: Mushy Zone Rheology**

9:20 – 9:40

*Dominique Bernard, L. Salvo, Ø. Nielsen*

Permeability Calculations on Real Al-Cu Microstructures Assessed by 3D Microtomography (019)

9:40 – 10:00

*O. Ludwig, B. Commet, J.M. Drezet, C.L. Martin, M. Suery*

Rheological Behavior of Partially Solidified Al-Cu Alloys: Experimental and Numerical Study (084)

10:00 – 10:20

Coffee Break

10:20 – 10:40

*A. Mo, M. M'Hamdi, H. G. Fjær*

Mushy Zone Rheology and Hot Tearing in Aluminum DC Casting (076)

**SESSION V: Microporosity Simulation**

10:40 – 11:00

*K. Carlson, Z. Lin, R. Hardin, C. Beckermann, G. Mazurkevich, M. Schneider*

Modeling of Porosity Formation and Feeding Flow in Steel Casting (027)

11:00 – 11:20

*J.Z. Guo, M. T. Samonds*

Microporosity Simulations in Multicomponent Alloy Castings (001)

11:20 – 11:40

*A. Kimatsuka, I. Ohnaka, J.D. Zhu, A. Sugiyama, T. Kamitsu*

Mold Filling Simulation of High Pressure Die Casting for Predicting Gas Porosity (070)

**SESSION VI: Segregation Simulation**

11:40 – 12:00

*A. Jacot, Q. Du, M. Rappaz*

A 2-Dimensional Microsegregation Model Coupled to a Thermodynamic Database for the Prediction of Solidification Microstructures in Multi-Component Alloys (072)

12:00 – 13:30

Lunch

13:30 – 13:50

*M. Wu, A. Ludwig, R. Sahm, A. Bührig-Polaczek*

Grain Evolution and Macrosegregation in an Al-4.0%Cu Casting: Simulation and Experimental Evaluation (033)

13:50

*ad hoc* discussions, free time

Tuesday, May 27, 2003 (continued)

- 17:40 Afternoon coffee
- 18:00 – 18:40 **Keynote Talk**  
*J. Campbell*  
Review – Defect Structure of Liquid Metals (000)
- J.-L. Desbiolles, Ph. Thévoz, M. Rappaz*  
Micro/Macrosegregation Modeling in Casting: A Fully Coupled 3D Model (120)
- 19:00 – 19:20 *A. Mouchmov, M. Cross, T. N. Croft, K. Pericleous, V. R. Voller*  
Macrosegregation of Multi-Component Alloys in Shape Casting Simulation (023)
- 19:20 – 19:30 Discussion
- 19:30 – 21:00 Dinner
- 21:00 **Poster Session II/Social Hour**
- N. W. Lai, W. D. Griffiths, J. Campbell*  
Modelling of the Potential for Oxide Film Entrainment in Light Metal Alloy Castings (106)
- S.Y. Lee, S. Lee, S. Nishido, C.P. Hong*  
A Numerical Model for Mold Filling Based on a Body-Fitted Coordinate System (060)
- J.-C. Gebelin, M. Jolly*  
Numerical Modeling of Metal Flow through Filters (93)
- N. Zabararas, D. Samanta, A.T. Subbiah*  
A Combined Experimental and Computational Approach for the Design of Mold Surface Topography that Leads to Desired Ingot Surface and Microstructure in Aluminum Castings (091)
- J.L. Hilden, K.P. Trumble*  
Capillarity Modeling and Experiments on Investment Casting Mold Filling (075)
- K.A. Pericleous, N. Strusevich, M. Hughes*  
Modeling the Metal Arc Weldpool (021)
- V. Plochikhine, A. Prikhodovsky, H.-W. Zoch, J. Silvanus, K. Müller, M. Makhutin, A. Ilin, H.J. Pesch*  
Influence of the Base Metal Composition on the Centerline Solidification Cracking in Laser Beam Welds (083)
- R.W. Hamilton, R.J. Dashwood, P.D. Lee*  
Modeling the Direct Powder Semi-Solid Molding (DPSM) of a Particle Metal Matrix Composite (108)
- J.Y. Su, D.N. Zou*  
Numerical Simulation of the Process of Laser Cladding In-Situ Synthesis TiCp/Al Composite on the Surface of Aluminum Alloy (002)

Tuesday, May 27, 2003 (continued)

*R. Sekula, K. Kaczmarek, D. Bednarowski, T. Nowak, O. Claus*  
Sequential Fluid Dynamics and Structural Mechanics Simulations of  
Reactive Molding Process (010)

*J. Zuidema Jr., L. Katgerman*  
Cyclone Separation of Particles in Aluminium DC Casting (102)

*C. Rogers*  
Numerical Mold and Core Sand Simulation (0202)

*G.F. Yao, C. W. Hirt, M. Barkhudarov*  
Development of a Numerical Approach for Simulation of Sand Blowing  
and Core Formation (080)

*N. Hueber, Valerie Vidal, G. Ogier*  
Thermodynamical Benchmark: From Numerical Simulation to Real  
Gravity Die-Casting Geometry (041)

*X. Xue, R. Luck, J.T. Berry, R.D. Pehlke*  
Specifying Interfacial Heat Transfer Conditions in Permanent Mold  
Castings: A Comparison of Two Promising Techniques (028)

*Th. Schnorf, J.-P. Gabathuler, Th. Imwinkelried*  
Heat Transfer Coefficients for Pressure Diecasting and Semi-Solid-  
Forming (032)

*E. Kaschnitz, M. Romansky, R. Mergen*  
Numerical Simulation of The Temperature Distribution in a Continuous  
Casting Process for the Production of AlSn(Cu) Alloys (018)



Wednesday, May 28, 2003

07:00 – 09:00

Breakfast

09:00 – 09:20

*G. Ehlen, A. Ludwig, P.R. Sahm, A. Bührig-Polaczek*  
Split-Solid-Model to Simulate the Formation of Shrinkage Cavities and Macro-segregations in Steel Casting (031)

**SESSION VII: Thermo-Mechanical Simulation**

09:20 – 09:40

*M. Bellet, V. Fachinotti, O. Jaouen, Sophie de la Chapelle, Isabelle Poitroult*  
Application of the Arbitrary Eulerian Lagrangian Finite Element Formulation to the Thermo-mechanical Simulation of Casting Processes, with Focus on Pipe Shrinkage Prediction (087)

09:40 – 10:00

*C. Li, B.G. Thomas*  
Thermo-Mechanical Finite Element Model of Shell Behavior in Continuous Casting of Steel (100)

10:00 – 10:20

*F. Costes, A. Heinrich, M. Bellet*  
3D Thermomechanical Simulation of the Secondary Cooling Zone of Steel Continuous Casting (011)

10:20 – 10:40

Coffee Break

**SESSION VIII: Shaped Casting Simulation**

10:40 – 11:20

**Keynote Talk**

*I. Ohnaka*

Recent Development of Numerical Modeling of Casting and Solidification (113)

11:20 – 11:40

*J.D. Zhu, I. Ohnaka, K. Kudo, S. Obara, A. Kimatsuka, T.M. Wang, F. Kinoshita, T. Murakami*  
Solidification Simulation with Consideration of Radiation by Using a New Regular-Irregular-Mixed Mesh System (071)

11:40 – 12:00

*D.M. Lipinski, S. Falter-Neves*  
Modeling of the Mold Filling for the Lost Foam Processing of Castings (030)

12:00 – 13:30

Lunch

13:30 – 13:50

*E. Pellikka, J. Wendt, A. Huovinen*  
How to Improve the High-Pressure Die Casting Process by State-of-the-Art Modeling (085)

13:50 – 14:10

*V. Kokot, P. Bernbeck*  
Integration and Application of Optimization Algorithms with Casting Process Simulation (046)

14:10 – 17:40

*ad hoc* sessions, free time

Wednesday, May 28, 2003 (continued)

17:40 – 18:00 Afternoon coffee

**SESSION IX: Continuous Casting Simulation**

18:00 – 18:20 *M. M'Hamdi, A. Håkonsen*  
Experimental and Numerical Study of Surface Macrosegregation in DC Casting of Aluminum Sheet Ingots (048)

18:20 – 18:40 *T.N. Croft, K.A. Pericleous, M. Bobadilla, P. Gardin*  
Three-Phase Dynamic Modeling of the Continuous Casting Process (022)

**SESSION X: Welding Simulation**

18:40 – 19:00 *N. El-Kaddah, K. Bisen, M. Arenas, V.L. Acoff*  
A Realistic Model for Numerical Simulation of GTA Welding Operations (114)

19:00 – 19:20 *Z. Xu, A. Mohammed, R. Kastelein*  
Modeling and Validation of an Electric Conductor Welding Process (008)

19:20 – 19:30 Discussion

19:30 Dinner

Thursday, May 29, 2003

07:00 – 09:00

Breakfast

**SESSION XI: Other Solidification Processes**

09:00 – 09:20

*R. Heringer, Ch.A. Gandin, G. Lesoult*  
Heat Flow Modeling of Equiaxed Solidification (074)

09:20 – 09:40

*J.H. Hattel, J. Thorborg, T.B. Pedersen, N.H. Pryds*  
An Integrated Approach for the Numerical Modeling of the Spray Forming Process (119)

09:40 – 10:00

*L. Nastac, Y. Pang, O. Yu, F. Spadafora, C. Wang, D. Winterscheidt*  
Magnetohydrodynamics in PAM Processed Ti-6Al-4V Ingots (006)

**SESSION XII: Simulation of Melting and Solid Separation in the Melt**

10:00 – 10:20

*V. Bojarevics, K. Pericleous, R. Harding, M. Wickins*  
Induction Skull-Melting Dynamics for Different Materials: Numerical Modeling and Comparisons with Experiments (025)

10:20 – 10:40

Coffee Break

10:40 – 11:00

*V. Warke, M. Maniruzzaman, M.M. Makhlouf*  
Inclusion Removal from Molten Metal by Particle Flotation: A Mathematical Model and Computer Simulations (014)

11:00 – 11:20

*D. Zeng, Y. Zhang, W. Liu, J. Su*  
Modeling of Melting Process of Ferrosilicon Block Used for In-Mold Inoculation (026)

**SESSION XIII: Aggregate and Porous Materials**

11:20 – 11:40

*V. Pavan, V. Vidal, P. Beauvais, M. Prat, O. Simonin, H. Neau*  
On Numerical Simulation of a Cold Box Process (050)

11:40 – 12:00

*A.G. Malan, R.W. Lewis, R.S. Ransing*  
Modeling Coupled Heat And Mass Transfer in Drying Capillary Hygroscopic and Non-Hygroscopic Porous Materials (107)

12:00 – 13:30

Lunch

**SESSION XIV: Database and Critical Experiments**

13:30 – 13:50

*N. Saunders, X. Li, A. P. Miodownik, J-Ph. Schillé*  
Modeling of the Thermo-Physical and Physical Properties Relevant to Solidification (116)

13:50 – 14:10

*R. H. Mathiesen, Lars Arnberg*  
In-Situ Experimental Observations of Dendritic Growth in AlCu-Alloys (005)

Thursday, May 29, 2003 (continued)

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| 14:10 – 14:30 | <i>M.D. Dupouy, D. Camel, J.E. Mazille</i><br>Influence of Natural Convection on Columnar to Equiaxed Transition during Directional Solidification of Refined Al Based Alloys - Relevance of Microgravity Experiments (052) |
| 14:30 – 17:30 | <i>ad hoc</i> sessions, free time   |
| 18:30         | Planning meeting  |
| 19:30         | Conference Banquet  |

Friday, May 30, 2003

07:00 – 09:00	Breakfast
09:00 – 09:40	<b><u>Keynote Talk</u></b> <i>J. Hoyt</i> Computing Thermodynamic and Kinetic Properties of Solid-Liquid Interfaces from Atomistic Simulations
09:40 – 10:00	<i>J. Adeleke, A. Muikku</i> Inverse Analysis for Determination of Interfacial Heat Transfer Coefficient in Complex Three-Dimensional Sand Casting Processes (086)
10:00 – 10:20	<i>S. Louhenkilpi, M. Uoti, H. Kytönen, S. Vapalahti</i> Effect of Thermophysical Material Data on Heat Transfer in Continuous Casting (053)
10:20 – 10:40	Coffee Break
10:40 – 11:00	<i>R. A. Harding, M. Wickins, V. Bojarevics, K. Pericleous</i> Obtaining Data to Validate a Model of an Induction Skull Melting Furnace (105)
11:00 – 11:45	Conference Closing
12:00	Distribution of lunch boxes