

Research Programs

SSM Related Publications (2002-Present)

2009

- Q. Xu, D. Apelian, M.M. Makhlof, "Numerical Modeling and Computer Simulation of the Continuous Rheoconversion Process", NADCA Congress Transactions, April 2009.
- A. M. de Figueredo, D. Apelian, M. Findon, and N. Saddock, "Alloy Substantially Free of Dendrites and Method of Forming the Same", US Patent No. 7,513,962, April 7, 2009.

2007

- John L. Jorstad, Q. Y. Pan, Diran Apelian, " Interaction of Key Variables During Rheocasting: Effects of Fraction Solid and Flow Velocity on Performance ", NADCA Transactions 2007.
- Q.Y. Pan, P. Hogan, D. Apelian, and M.M.Makhlof, "The Continuous Rheoconversion Process (CRP™)", in the Proceedings of LMT – Light Metals Technology 2007, September 2007, Saint-Sauveur, Québec, CA, published by CANMET.
- Q. Y. Pan, D. Apelian, "Semi-Solid Metal (SSM) Processing Methods: An Overview", in Proceedings of 2007 Xi'an International Symposium on Solidification, Northwestern Polytechnical University, May 29-31,2007.
- Q.Y Pan, Diran Apelian & John Jorstad, "Semi-Solid Casting: Introduction and Fundamentals", ASM Vol. 15: Casting, published by ASM (2007), pp. 761-763.
- Q.Y Pan, Diran Apelian & John Jorstad, "Rheocasting", ASM Vol. 15: Casting, published by ASM (2007), pp. 773-776.
- Q.Y Pan, Diran Apelian & John Jorstad, "SemiSolid Metal Processing", ASM Vol. 15: Casting, published by ASM (2007), pp. 379-381.

2006

- Q.Y. Pan, P. Hogan, and D. Apelian, "*Optimization of Commercial Alloys for Semi-Solid Processing*", NADCA Transactions (2006).
- J. L. Jorstad, Q. Y. Pan, and D. Apelian, "*A Rheocasting Route: SLC + CRP, A Marriage of Unique Processes*", NADCA Transactions (2006).
- D.Apelian, M.M. Makhlof, and D. Saha, "*CDS Method for Casting Aluminum-Based Wrought Alloy Compositions: theoretical framework* ", Materials Science Forums Vols. 519-521 (2006) pp 1771-1776.
- J. L. Jorstad, and Q. Y. Pan, "*Interaction of Key Variables During Rheocasting: Importance of Microstructure, Fraction Solid and Flow Velocity*", in the Proceedings of 9th International S2P, Busan, Korea, September 11-13, 2006 (Keynote Paper).
- Q.Y. Pan, S. Wiesner, D. Apelian, "*Application of the Continuous Rheoconversion Process (CRP) to Low Temperature HPDC-Part I: Microstructure*", in the Proceedings of 9th International S2P, Busan, Korea, September 11-13, 2006.
- S. Wiesner, Q.Y. Pan, D. Apelian, "*Application of the Continuous Rheoconversion Process (CRP) to Low Temperature HPDC-Part II: Alloy Development & Validation*", in the Proceedings of 9th International S2P, Busan, Korea, September 11-13, 2006.
- D. Apelian, "*SSM and Squeeze Casting: Principles & Opportunities*", NADCA Transactions 2006

2005

- Q.Y. Pan, L. Wang, D. Apelian and M.M. Makhlof , "*Optimization of 380 Alloy for Semi-Solid Processing*", NADCA Transactions, #T05-143 (2005).
- W. J. Bernard III, Q. Y. Pan, D. Apelian and M.M. Makhlof, "*The Continuous Rheoconversion Process (CRP): Modeling and Optimization*", NADCA Transactions, #T05-141 (2005).
- B. Dewhirst, J.L. Jorstad, and D. Apelian, "Effect of Artificial Aging on Microstructure and Mechanical Properties of Semi-Solid Processed A356 Castings", NADCA Transactions, #T05-063 (2005) - Selected as the Best Paper of the Congress.
- D. Saha, S. Shankar, D. Apelian, M. M. Makhlof, "*Controlled Diffusion Solidification - Manufacturing Net Shaped Al Based Wrought Alloy Parts*", in Shape Casting: The John Campbell Symposium, published by TMS - ISBN # 0-87339-583-2, pp 415-422 (2005).
- D. Saha, S. Shankar, M. Makhlof and D. Apelian, "*Casting of Aluminum Alloys with a Globular Primary Phase Using Controlled Diffusion Solidification*", submitted to Met and Mat Trans A.
- D. Saha, and D. Apelian, "*On the Dissolution of Al in Al-Si Liquid During the Mixing of Al-25% Si and Al-7% Si Alloys*", submitted to Met and Mat Trans B.
- D. Apelian, D. Saha, "*Novel and Advanced Solidification Processes for the Manufacture of High Integrity Aluminum Cast Components*", in the Proceedings of Second Intl. Light Metals Technology 2005, St. Wolfgang, Austria, published by LKR, pp 203-208.
- J. L. Jorstad, Q. Y. Pan, D. Apelian, "*Solidification Microstructure Affecting Ductility in Semi Solid (SSM) Cast Products*", Materials Science and Engineering A V 413-414 (2005) pp 186-191.
- J. L. Jorstad, D. Apelian, "*Pressure Assisted Processes for High Integrity Automotive Aluminum Castings - Part I: Principles and Fundamentals*", in Proceedings of the International Conference on High Integrity Metal Castings, October 31 -November 1, 2005, Indianapolis, IN, published by AFS, Chicago, Ill. (2005).
- J. L. Jorstad, D. Apelian, "*Pressure Assisted Processes for High Integrity Automotive Castings - Part II: Recent Developments and Innovations*", in Proceedings of the International Conference on High Integrity Metal Castings, October 31 -November 1, 2005, Indianapolis, IN, published by AFS, Chicago, Ill. (2005).

2004

- Zachary Brown, Rathindra DasGupta, Dayne Killingsworth, Mark Musser, and Diran Apelian, "*Semi-Solid Metal Casting Practices: Past, Present and Future*", Proceedings of SAE 2004, Detroit, MI.
- Q.Y. Pan, M. Arsenault, D. Apelian and M.M. Makhlof, "*SSM Processing of AlB2 Grain Refined Al-Si Alloys*", AFS Transactions, Vol. 112, June 2004, pp 04-053.
- M. Findon and D. Apelian, "*The Continuous Rheoconversion Process for Semi-Solid Slurry Production*", AFS Transactions, Vol. 112, June 2004, pp 04-056.
- D. Saha and D. Apelian, "*Semi Solid Processing of Hypereutectic Alloys*", AFS Transactions, Vol. 112, June 2004, pp 04-057.
- D. Apelian, Q.Y. Pan, M. Findon "*Low Cost and Energy Efficient Methods for the Manufacture of Semi-Solid (SSM) Feedstock*", Die Casting Engineer, V. 48, No. 1, January 2004, pp. 22-28.
- Q.Y. Pan, D. Apelian and A.N. Alexandrou, "*Yield Behavior of Commercial Aluminum Alloys In The Semi-Solid State*", Metallurgical and Materials Transactions (B), Vol. 35B, December 2004, pp 1187-1202.
- Deepak Saha, Sumanth Shankar, Diran Apelian, and Makhlof M. Makhlof, "*Casting of Aluminum Based Wrought Alloys using Controlled Diffusion Solidification*", Metallurgical and Materials Transactions A, Vol. 35A, July 2004, pp. 2174-2180.
- D. Apelian, Q.Y. Pan, M. Findon and M. M. Makhlof, "*Low Cost and Energy Efficient Methods for the Manufacture of Semi-Solid (SSM) Feedstock*", in the Proceedings of HTDC (ISBN 88-86259-26-3), Brescia, Italy, published by Edimet, Brescia, Italy 2004, pp. 323-332.
- Deepak Saha, Diran Apelian, and Rathindra Dasgupta, "*Inoculants for the Control of Primary Si Size and Distribution in Hypereutectic Alloys*", Paper # 8-1 in the Proceedings of the Eighth

- International Conference on Semi-Solid Processing of Metals and Alloys, Limasol, Cyprus, September 2004; published by NADCA, Wheeling, Illinois.
- Deepak Saha, Diran Apelian, and Rathindra Dasgupta, "*SSM Processing of Hypereutectic Al-Si Alloys - an overview*", Paper # 22-1 in the Proceedings of the Eighth International Conference on Semi-Solid Processing of Metals and Alloys, Limasol, Cyprus, September 2004; published by NADCA, Wheeling, Illinois.
 - Q.Y. Pan, M. Findon and D. Apelian, "*The Continuous Rheoconversion Process (CRP): A Novel SSM Approach*", Paper # 2-4 in the Proceedings of the Eighth International Conference on Semi-Solid Processing of Metals and Alloys, Limasol, Cyprus, September 2004; published by NADCA, Wheeling, Illinois.
 - Q.Y. Pan, D. Apelian and M. M. Makhlof, "*AlB₂ Grain Refined Al-Si Alloys: Rheocasting/Thixocasting Applications*", Paper # 13-1 in the Proceedings of the Eighth International Conference on Semi-Solid Processing of Metals and Alloys, Limasol, Cyprus, September 2004; published by NADCA, Wheeling, Illinois.
 - A.N. Alexandrou, G.C. Florides, G.C. Georgiou and D. Apelian, "*Rheological Effects of Structure Breakdown in Semisolid Slurries*", Paper # 9-1 in the Proceedings of the Eighth International Conference on Semi-Solid Processing of Metals and Alloys, Limasol, Cyprus, September 2004; published by NADCA, Wheeling, Illinois.
 - S. Shankar, D. Saha, D. Apelian, and M.M. Makhlof, "*CDS: Controlled Diffusion Solidification - A Novel Casting Approach*", Paper # 16-2 in the Proceedings of the Eighth International Conference on Semi-Solid Processing of Metals and Alloys, Limasol, Cyprus, September 2004; published by NADCA, Wheeling, Illinois.
 - N. Tonmukayakul, Q. Y. Pan, A. N. Alexandrou and D. Apelian, "*Transient Flow Characteristics and Properties of Semi-Solid Aluminum Alloy A356*", Paper # 3-4 in the Proceedings of the Eighth International Conference on Semi-Solid Processing of Metals and Alloys, Limasol, Cyprus, September 2004; published by NADCA, Wheeling, Illinois.
 - S. K. Chaudhury, Q. Y. Pan and D. Apelian, "*Response of Fluidized Bed Heat Treatment on Semi-Solid Al Castings on Microstructure and Mechanical Properties*", Paper # 15-4 in the Proceedings of the Eighth International Conference on Semi-Solid Processing of Metals and Alloys, Limasol, Cyprus, September 2004; published by NADCA, Wheeling, Illinois.
 - D. Apelian, Q.Y. Pan and M. M. Makhlof, "*Low Cost and Energy Efficient Methods for the Manufacture of Semi-Solid (SSM) Feedstock*", in NADCA Transactions, AFS/NADCA 108th Congress, June 2004, Session 3: Cast Materials, T01-033.

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- D. Apelian, A. de Figueredo, M.M. Makhlof "*Energy Efficient Near-net Shape Manufacturing: semi-solid processing routes*", in the Proceedings of The MPMD Fourth Global Innovations Symposium: Energy Efficient Manufacturing Processes, Edited by I. Anderson, T. Marechaux, and C. Cockrill, published by TMS (The Minerals, Metals & Materials Society), 2003, pp 55-62.
- J. L. Jorstad, M. Thieman, R.Kamm M. Lukasson, D. Apelian, R. DasGupta, "*Bringing SSM Casting to the Masses*", Modern Casting, Vol. 93, No. 10, October 2003, pp. 34-36
- Deepak Saha, Rathindra Dasgupta, and Diran Apelian, "*SSM Processing of Al-Si Alloys Utilizing the Concept of Diffusion Solidification*", in the Proceedings of the NADCA Congress, September 15-17, 2003.
- John L. Jorstad, Diran Apelian, and Makhlof M. Makhlof, "*Novel, Slurry-Based, Semi Solid Processing Routes*", In the Proceedings of the Light Metals Technology Conference 2003, September 18-20, 2003. Brisbane, Australia, Editor: Arne Dahle, Published by CAST, 2003, pp. 109-114.

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- M. Lukasson, D. Apelian, and R. DasGupta, "*Alloy Characterization for the UBE NRC Process*", in *AFS Transactions* 2002, 02-032, pp.1-14.
- D. Apelian, "*Semi-Solid Processing Routes and Microstructure Evolution*", in the Proceedings of the Seventh International Conference titled *Advanced Semi-Solid Processing of Alloys and Composites*, Tsukuba, Japan, September 24-28, 2002. Published by the Natl. Inst. Of Advanced Industrial Science and Technology, Japan, 2002, pp. 25-30.
- A.N. Alexandrou, P. LeMenn, D. Apelian, G. Georgiou, "*On The Reliability of the Semisolid Metal Process: Effects on the Yield Stress*", in the Proceedings of the Seventh International Conference titled *Advanced Semi-Solid Processing of Alloys and Composites*, Tsukuba, Japan, September 24-28, 2002. Published by the Natl. Inst. Of Advanced Industrial Science and Technology, Japan, 2002, pp. 503-508.
- A.N. Alexandrou, Q. Pan, D. Apelian, G. Georgiou, "*Semisolid Material Characterization Using Computational Rheology*", in the Proceedings of the Seventh International Conference titled *Advanced Semi-Solid Processing of Alloys and Composites*, Tsukuba, Japan, and September 24-28, 2002. Published by the Natl. Inst. Of Advanced Industrial Science and Technology, Japan, 2002, pp. 417-422.
- D. Saha, D. Apelian and R. DasGupta, "*SSM Processing of Hypereutectic Al-Si Alloy Via Diffusion Solidification*" in the Proceedings of the Seventh International Conference titled *Advanced Semi-Solid Processing of Alloys and Composites*, Tsukuba, Japan, and September 24-28, 2002. Published by the Natl. Inst. Of Advanced Industrial Science and Technology, Japan, 2002, pp. 323-328.
- Q. Pan and D. Apelian "*Quantitative Microstructure Characterization of Commercial Semi-Solid Aluminum Alloys*", in the Proceedings of the Seventh International Conference titled *Advanced Semi-Solid Processing of Alloys and Composites*, Tsukuba, Japan, and September 24-28, 2002. Published by the Natl. Inst. Of Advanced Industrial Science and Technology, Japan, 2002, pp. 563-568.
- Q. Pan, D. Apelian and R. DasGupta "*Yield Stress of Commercial Semi-solid Billets: processing effects and the role of microstructure*", in the Proceedings of the Seventh International Conference titled *Advanced Semi-Solid Processing of Alloys and Composites*, Tsukuba, Japan, September 24-28, 2002. Published by the Natl. Inst. Of Advanced Industrial Science and Technology, Japan, 2002, pp. 737-742.
- A.M. de Figueredo, M. Findon, D. Apelian, and M.M. Makhlof, "*Melt Mixing Approaches for the Formation of Thixotropic Semi-Solid Metal Structures*", in the Proceedings of the Seventh International Conference titled *Advanced Semi-Solid Processing of Alloys and Composites*, Tsukuba, Japan, and September 24-28, 2002. Published by the Natl. Inst. Of Advanced Industrial Science and Technology, Japan, 2002, pp. 557-562.