

# Table of Contents

## Foreword

### Current Status of Austempered Cast Irons

R. Elliott 1

### On the Mechanisms of Spherulitic Growth in Polymer and Iron Melts

G. Fairve 17

### Cast Iron as a Composite: Conductivities and Elastic Properties

G. Grimvall 31

### Fracture Characteristics and Fracture Toughness of Spheroidal Graphite Cast Iron

T. Kobayashi 47

### Behavior of Oxygen and Nucleation of Graphite in Production of Spheroidal Graphite Cast Iron

T. Kusakawa 61

### Influence of Mould Filling and Natural Convection on the Solidification of Cast Iron

F. Mampaey 73

### Methodologies for and Performance of Macro Transport-Transformation Kinetics

#### Modeling of Cast Iron

D.M. Ștefănescu 89

### The Status in Cast Iron Microstructure Engineering and Interactions with Computer Aided Modelling

R. Weber, J.C. Sturm and P.R. Sahm 105

### Trends and Metallurgical Factors Involved in Automotive Cast Iron Parts

J. Le Gal 129

### Microstructural Evolution of Spheroidal Graphite Cast Iron at High Temperature: Consequences on Mechanical Behaviour

P. Bastid, P. Pilvin, C. Grente and E. Andrieu 139

### Characterization and Measurement of the Modulus of Elasticity of Ductile Irons

L. Fang, K.E. Metzloff, R. Voigt and C.R. Loper 147

### Study of Physico-Chemical Mechanisms Responsible for Damage of Heat Treated and As-Cast Ferritic Spheroidal Graphite Cast Irons

P. Dierickx, C. Verdu, J.-. Rouais, A. Reynaud and R. Fougères 153

### Microstructures and Superplasticity of Rapidly Solidified White Cast Iron Materials

G. Frommeyer, O.D. Sherby, O. Ruano, W.J. Kim and J. Wolfenstine 161

### Counting Eutectic Grains in S.G. Cast Iron

G. Rivera, R. Boeri and J. Sikora 169

### Influence of Silicon Content and Heat Treatment Conditions on Impact Characteristics in the High Toughened Austempered Ductile Cast Iron with Additions of Nickel and Manganese

M. Aoyama and T. Kobayashi 175

### Damage Effect on the Fracture Toughness of Nodular Cast Iron

M.J. Dong, B. Tie, A.S. Béranger, C. Prioul and D. François 181

### Relation between Microstructure Size and Ductile-Brittle Transition Behaviour in Fracture Toughness of Ferritic Nodular Cast Iron

T. Shiosaki, S. Komatsu, T. Shiota, K. Nakamura and H. Kyogoku 189

### Effect of Thermomechanical Treatment on Toughness of Spheroidal Graphite Cast Iron

S. Yamada and T. Kobayashi 195

### The Influence of Austempering and Induction Hardening on Strength and Fatigue of Spheroidal Cast Iron

H. Vettters, H. Bomas, P. Mayr, Y.C. Liu and J.M. Schissler 203

### Notch Strength of Cast Iron under Static and Fatigue Loading

T. Noguchi, K. Shimizu and M. Fujita 213

### Estimation of the Tolerable Defects in Brake Disk Made from Spheroidal Graphite Cast Iron

M.B. Gołaska, L. Gołaski and A. Kowalski 219

### Study on the Fatigue Properties of Austempered Ductile Irons

C. Cheng and J.J. Vuorinen 227

<b>Effect of Initial Flaws on Fatigue Crack Initiation of Austempered S.G. Cast Iron</b>	233
A.S. Béranger, R. Billardon and F. Hild	
<b>Basic Study on Erosion of Ductile Iron</b>	239
K. Shimizu, T. Noguchi, T. Kamada and S. Doi	
<b>Study of the Wear Resistance of Gray, Vermicular and Ductile Iron under the Oxidational Condition</b>	245
Y. Liu, S. Ren, J.M. Schissler and J.P. Chobaut	
<b>Wear and Fatigue Properties of Austempered Ductile Iron</b>	251
J. Tartera, J.M. Prado and A. Pujol	
<b>Shaping the Structure and Properties of ADI with High Mn Content through Changes in Chemical Composition and Heat Treatment</b>	259
A. Kowalski and M. Biel-Gołaska	
<b>Oxygen Activity of Ductile Iron Melts - Its Relationship to the Solidification and Shrinkage Behaviour</b>	269
R. Hummer	
<b>Inoculation of Spheroidal Graphite Cast Iron</b>	277
V. Cochard, R.A. Harding, J. Campbell and R. Hérold	
<b>An Investigation of the Influence of Chemistry on Metal Penetration in Gray Iron Castings</b>	285
F.J. Bradley, E.J. Kubick and A.K. Mirle	
<b>Sulphur Inoculation of Mg-Treated Cast Iron - An Efficient Possibility to Control Graphite Morphology and Nucleation Ability</b>	293
M. Chisamera and I. Riposan	
<b>Synthetic Cast Iron Melted in an Induction-Plasma Furnace</b>	301
W. Lybacki, Z. Ignaszak, A. Modrzynski and A. Baranowski	
<b>Development of New Container Manufacturing Process by Vertical Type Centrifugal Casting Method and its Solidification Analysis</b>	307
S.G. Kim, T. Umeda, K. Murata, D. Sakurai and M. Minami	
<b>Production of As-Cast Austenitic-Bainitic Ductile Iron Rolls</b>	313
Y. Niu, S. Long and G. Zheng	
<b>Microstructure of Semi-Solid Fe-C Alloy Billet for Thixocasting by Powder Compaction</b>	321
M. Tsujikawa, K. Tanaka, C. Ushigome, S. Nishikawa and M. Kawamoto	
<b>Measurement of Permeability on the Mushy Zone of Lamellar Graphite Cast Iron</b>	327
S. Hiratsuka and D.M. Ţătărescu	
<b>Castability Test Applied to Grey Iron</b>	335
B. Garda and F. Durand	
<b>Spheroidal Graphite Cast Iron Hard-Faced by TIG Arc Remelting Process and its Fatigue Properties</b>	341
T. Hiraoka and Y. Tanaka	
<b>Rim Zone Metallurgy: A Coating System to Improve the Microstructure in the Surface-Affected Zone of Permanent Mold Cast Spheroidal Ductile Iron</b>	347
V. Helling and P.R. Sahm	
<b>The Effect of Grain Growth upon Eutectic Carbide Particle Coarsening in H.S.S.</b>	355
M. Durand-Charre, J.M. Chaix and P.H. Yang	
<b>Solidification of High Speed Steel Type Cast Iron</b>	361
K. Ogi, H. Miyahara, Z. Hong and N. Murai	
<b>Unidirectional Solidification of Cast Iron: Morphological Changes of Graphite Due to In-Situ Modification</b>	369
A.N. Roviglione and H. Biloni	
<b>Contribution to the Effects of Magnesium-Treatment, Inoculation and Section Thickness on the Spherulite Formation in Spheroidal Graphite Cast Iron</b>	377
R. Doepp, B. Prinz, K.J. Reifferscheid, E. Schuermann and T. Schulze	
<b>The Isothermal Transformation of Ductile Cast Iron</b>	385
M.C. Leijten, H. Nieswaag and L. Katgerman	
<b>Control of Eutectic Carbide Precipitation and UAV Formation in 1% Mn Ductile Iron</b>	391
A.M. Nili, E. Niyama and T. Ohide	
<b>A Stepped Austempering Heat Treatment for a Mn Alloyed Ductile Cast Iron</b>	399
H. Bayati and R. Elliott	

<b>Structural Evolution of Austempered Ductile Iron (ADI) during Tempering</b>	407
Y.C. Liu, J.M. Schissler, J.P. Chobaut and H. Vetters	
<b>Austempering Kinetics in Cu-Mo Alloyed Ductile Iron: A Dilatometric Study</b>	415
M.M. Cisneros-Guerrero, R.E. Campos-Cambranis, M. Castro-Román and M.J. Pérez-López	
<b>On the Characterization of Nodule Size Distributions of Commercial Ductile Iron Alloys</b>	421
S.Y. Huang and F.J. Bradley	
<b>Characterizing the Form of Graphite in Cast Irons Using an Image Analyser</b>	427
J. Fargues, M. Hecht and M. Stucky	
<b>Functional Improvement of Dilatation Analysis on Thermal Analysis for S.G. Iron Quality Estimation</b>	433
Y. Yang and J. Alhainen	
<b>Using Thermal Analysis to Predict the Microstructure of Cast Iron</b>	439
<b>Application of Fourier's Thermal Analysis to the Determination of Kinetics Solidification of Cast Iron</b>	
E. Fraś, W. Kapturkiewicz, A.A. Burbielko and E. Guzik	445
<b>3D Stochastic Modelling of Nodular Cast Iron Solidification</b>	
C. Charbon and M. Rappaz	453
<b>Graphite Growth in S.G. Cast Irons: Simulation vs. Experiment</b>	
Y. Zhang, S.V. Subramanian and G.R. Purdy	461
<b>Modeling of the Stable-to-Metastable Structural Transition in Cast Iron</b>	
L. Nastac and D.M. Ștefănescu	469
<b>Modelling and Simulation of Ferrite Growth in Nodular Cast Iron</b>	
M. Wessen and I.L. Svensson	479
<b>Columnar Dendrite Growth in Cast Iron</b>	
F. Mampaey and Z.A. Xu	485
<b>Microsegregation in Spheroidal Graphite Iron: A Numerical Model and its Validation</b>	
S. Chang and D.M. Ștefănescu	491
<b>Computer Modeling of Primary Structure Formation in Ductile Iron</b>	
E. Fraś, W. Kapturkiewicz and A.A. Burbielko	499
<b>Metastable Solidification of Eutectic Grey Cast Irons</b>	
H. Fredriksson	505
<b>Morphological Stability of Graphite Growth from Cast Iron Melt</b>	
S. Long and Y. Niu	513
<b>Modelling the Filtration of Cast Iron by Lattice Gas</b>	
R. Bremond, D. Jeulin, M. Abouaf and C. His	521
<b>Prediction of Microstructures in Freezing of Cast Irons</b>	
A. Kagawa and Y. Ohta	529
<b>Integration of Casting Process and Microstructure Modelling in an Industrial Nodular Iron Casting by Computer Simulation</b>	
I.L. Svensson and M. Wessen	535
<b>A New Shrinkage Cavity Prediction Method for Solidification Simulation of S.G. Iron Casting</b>	
B.C. Liu, J. Li and R. Liu	543
<b>Residual Stress Computation and Analysis of Machine Tool Bed Casting</b>	
B.C. Liu, R. Zhu, S.J. Xiong, Y. Gao and Y. Zhang	551
<b>Constitutive Equations to Simulate the Casting of S.G. Cast Iron Parts</b>	
R. Billardon, N. Hamata, D. Marquis and D. Visconte	557