

Table of Contents

Preface

Metal Foams: Keynotes

An Overview of the Mechanical Properties of Foams and Periodic Lattice Materials N.A. Fleck	3
Fabrication and Properties of Porous Materials with Directional Elongated Pores H. Nakajima	7
Metal Foam as a Combination of Lightweight Engineering and Damping R. Neugebauer, T. Hipke, J. Hohlfeld and R. Thümmler	13
VFT: The Novel Vacuum Foaming Technology for Mg-Foams H. Kaufmann, K. Renger and R. Kretz	19
A New Generation of Materials and Products P. Schäffler	25

Metal Foams: Processes

Analysis of Metal Foaming Behaviour and Development of Foaming Processes F. Garcia-Moreno, N. Babcsán, J. Banhart, M. Haesche and J. Weise	31
Study on the Production of Metal Foams Using Maxima of the Hydrogen Solubility of Casting Alloys J. Weise and J. Baumeister	35
The New Easy Foam-Process - Manufacture and Investigation of Metal Foam Hybrid Components E. Lugscheider, C. Liebscher, M. Maurer and L. Zhao	39
Simulation of Metal Foam Formation with the Lattice Boltzmann Method M. Öchsner, M. Thies, M. Arnold, C. Körner and R.F. Singer	45
Production of Fe-Cr-C-Base Foam: Theoretical Considerations and Practical Fabrication A. Makaya and H. Fredriksson	49
Effect of Powder Blending Ratio on Pore Morphology of Combustion Processed Al-Ni Foams R. Wang, M. Kobashi and N. Kanetake	53
Influence of Powder Pre-Treatments on Metal Foam Pore Structure B. Matijasevic-Lux, A. Rack, A. Haibel and J. Banhart	57
Investigation of Micropore Creation on the PM-Foam Morphology A. Ibrahim, C. Körner and R.F. Singer	61
Casting of Metallic Sponges Using Rapid Prototyping A. Bührig-Polaczek, D. Fettweis and M. Hett	65
Precision Cast Near-Net-Shape Components Based on Cellular Metal Materials D. Fettweis, C. Hintz and A. Bührig-Polaczek	69
Injection Moulding of Magnesium Integral Foams M. Hirschmann, C. Körner and R.F. Singer	73
Production and Properties of Foamed Magnesium F.W. Bach, D. Bormann, P. Wilk and R. Kucharski	77
Synthesis of Open Cell Metal Foams by Microwave Radiation Route L. Bonaccorsi and E. Proverbio	81
SlipReactionFoamSintering (SRFS)- Process: Production, Parameters, Characterisation S. Angel, W. Bleck and P.-. Scholz	85
Sintered Open-Celled Metal Foams Made by Replication Method - Manufacturing and Properties on Example of 316L Stainless Steel Foams J. Adler, G. Standke and G. Stephani	89
Closed Cell Metal-Hollow-Sphere-Structures Made by Expandable Polystyrene Technology M. Reinfried, U. Waag, G. Stephani and B. Kieback	93

Metal Foams: Properties

Micromechanical Modelling and Experimental Characterization of the Deformation Behaviour of Open-Cell Metal Foams	
S. Demiray, A. Ohrndorf, W. Becker, J. Hohe, U. Krupp and H.J. Christ	99
Notch Sensitivity of Aluminium Foams under Fatigue Loading	
H. Harders and J. Rösler	103
Strain-Hardening and Damage of Foamed Aluminium during Tensile Deformation	
R. Jancek, A. Kottar, B. Kriszt and H.P. Degischer	107
Simulation of Cellular Aluminium: Crash and Impact	
M. Wicklein, S. Hiermaier and K. Thoma	111
Effect of Cell Characteristics on the Compressive Deformation Behavior of a Closed-Cell Aluminium	
Y. Yamada, T. Asahina and C.E. Wen	115
Characterization and Simulation of the Mechanical Behaviour of Aluminium Foams	
D.-. Sun and F. Andrieux	119
Structure Evaluation of Aluminium Foams and Relationships to Compression Strength	
U. Mosler, U. Martin, A. Müller, G. Heinzel and H. Oettel	123
Influence of the Local Density Distribution on the Mechanical Properties of Aluminum Foam	
S. Rohde and M. Schlimmer	127
Advanced Pore Morphology (APM) Aluminium Foams - Concept, Process and Characteristics	
K. Stöbener, J. Baumeister, D. Lehmhus, G. Rausch and M. Busse	131
Tension and Compression Behaviour of Stainless Steel (316L) Hollow Sphere Structures	
O. Friedl, C. Motz, J. Färber, M. Stoiber and R. Pippal	135
Determination of Linear and Non-Linear Mechanical Properties of Sintered Hollow-Sphere Structures	
J. Franeck and G. Landgraf	139
Control of the Carbon Content in Metal Hollow Sphere Structures by Variation of the Debindinging Conditions	
T. Studnitzky and O. Andersen	143
3D Characterisation of Metallic Foams by Micro Tomography	
E. Jasiūnienė, Y. Onel and B. Illerhaus	147
Characterization of the Internal Structure of Aluminum Foams by Thermal Conductivity Values and Computed Tomography	
E. Solórzano, J.A. Reglero, M.A. Rodríguez-Pérez and J.A. de Saja	151
Quantitative Structural Characterisation of Aluminium Foams by Micro Computer Tomography	
O. Brunke, S. Odenbach and F. Beckmann	155
Analysis of Volume Images - A Tool for Understanding the Microstructure of Foams	
M. Godehardt, K. Schladitz and T. Sych	159

Metal Foams: Component Fabrication and Application

Fatigue Behaviour of Ultrasonically Welded Aluminium-Foam-Sandwich (AFS)/Sheet-Metal-Joints	
C. Born, H. Kuckert, G. Wagner and D. Eifler	165
Study of Adsorption/Desorption Behaviors of Porous Structures	
J. Musiol, H. Baur and U. Glatzel	169
Design and Construction of an Energy Absorber Prototype Based on Aluminum Foams	
J.A. Reglero, E. Porras, A. Fernández, M.A. Rodríguez-Pérez and J.A. de Saja	173
High-Temperature-Forming of Aluminium Foam for Application in Sandwich Components	
M.C. Hahn and A. Otto	177
Detachable Fasteners for Aluminium Foams	
F.W. Bach, D. Bormann, P. Wilk and R. Kucharski	181

Laser Welding of Cellular Metallic Materials	
H. Haferkamp, J. Bunte, D. Herzog and A. Ostendorf	185
Investigations on Foaming AFS-Tailored Blanks	
S. Dörfler and A. Otto	189

Polymer Foams: Keynotes

Physics of Polymer Foams	
J.K.W. Sandler and V. Altstädt	195
The Role of Rheology in Foaming Polymers	
H. Münstedt and J. Stange	201

Polymer Foams: Processes

OptifoamTM – A New Process for Thermoplastic Foams	
S. Habibi-Naini	209
Foam Extrusion of Polyetherimide with Chemical Blowing Agents	
D. Langenfelder, J.K.W. Sandler, M. Vasold and V. Altstädt	213
Polypropylene Foam	
M. Stadlbauer	217
Rheological Properties and Foaming Behaviour of Linear and Long-Chain Branched Polypropylenes	
J. Stange, D. Auhl and H. Münstedt	223

Polymer Foams: Particle Foams and Simulation

Mechanical Behaviour of Polymer Foams under Multiaxial Loads	
M. Münch and M. Schlimmer	229
Experimental Investigation of Polypropylene Foams as Base for Numerical Simulation	
C.M. Fremgen, U. Huber and M. Maier	233
Experimental and Numerical Studies of Polymer Foaming Process	
T.R. Tuladhar and M.R. Mackley	239
Improved Cost-Performance Relationships for Expandable Polypropylene (EPP) Particle Foam Components by Online-Monitoring of Processing Parameters	
S. Roth, C. Trassl and D. Kunz	243

Polymer Foams: Foam Injection Molding

Injection-Molded Thermoplastic Foam in Multi-Layer Arrangements	
N. Müller and G.W. Ehrenstein	249
Foam Injection-Moulding of Low Density Polymer Components	
A. Mantey, J. Moll, D. Kunz, J.K.W. Sandler and V. Altstädt	253
Microcellular Moulding with Gas Counter Pressure Using Physical Blowing Agent	
A.K. Bledzki, H. Kirschling, G. Steinbichler and P. Egger	257

Polymer Foams: Electrets

Ferroelectrets: Polymer Foams for Piezoelectric Transducers	
M. Wegener and R. Gerhard-Multhaupt	263

Polymer Foams: Commercial Applications and Products

Polyurethane Foams	
W. Friederichs	269

Structural Foams and Acoustic Materials	
B. Mayer	271
Basotect® - From Brittle to Flexible	
H. Baumgartl and M. Ehrenstein	275
Chemical Foaming Agents and Their Applications	
K. Raasch-Malberg	277
Polymeric Foams as Performance Materials for Sportshoes	
K. Knoerr	281