

Table of Contents

Preface

Plastic Deformation in Metals with Nanosized Grains: Atomistic Simulations and Experiments

H. Van Swygenhoven 3

Modelling Grain Boundary Sliding from First Principles

C. Molteni 11

Multi-Scale Modeling of Nanocrystalline Materials

N. Chandra and S. Namilae 19

Grain Boundary Sliding of 5(001) Twist Grain Boundary in Aluminium Bicrystal from First-Principles Calculations

T. Uesugi, K. Tsuchiya, M. Kohyama and K. Higashi 27

Assessment of Contribution of Intragranular Slip to Grain Boundary Sliding in Bicrystals

A.D. Sheikh-Ali and H. Garmestani 33

Cooperative Grain Boundary Processes in Superplastic Flow

M. Zelin and A.K. Mukherjee 41

Dynamics of Grain Boundary Networks in Superplasticity

F. Wakai, T. Akatsu and Y. Shinoda 49

Comparison between 2D and 3D Characterisations of Damage Induced by Superplastic Deformation

H.Q. Yu, J.J. Blandin and L. Salvo 55

Dynamic Grain Growth in Superplastic and Non-Superplastic Aluminium Alloys

P.S. Bate, K.B. Hyde, S.A. Court and J.F. Humphreys 61

Cavitation Behaviors in a Tetragonal Zirconia Polycrystal Subjected to Superplastic Deformations Measured by SANS Method

S. Harjo, Y. Motohashi, J. Saroun, V. Ryukhtin, P. Strunz, M. Baron and R. Loidl 67

Simulation of Superplastic Deformation Based on a Mantle Model

B.N. Kim, K. Morita and K. Hiraga 73

Dynamic Grain Growth in a Non-Superplastic Al-6Ni Alloy

K.B. Hyde and P.S. Bate 79

Physical Theory of Superplastic Flow in Spatially Extended Crystalline Systems

J.D. Muñoz-Andrade 85

Constitutive Equation for Superplastic Flow in Light Metallic Materials

H. Watanabe, T. Mukai and K. Higashi 91

Grain-Size-Dependent Cooperative Grain-Boundary Sliding in Superplastic Deformation

H. Muto, Y. Takahashi and M. Sakai 97

Multi-Scale Analysis of Failure during Superplastic Deformation

N.V. Thuramalla, P.V. Deshmukh and M.K. Khraisheh 105

The Measurement of Friction for Superplastic Forming of Ti-6Al-4V

R.B. Kelly, S.B. Leen, I.R. Pashby and A.R. Kennedy 111

Finite Element Simulation for Superplastic Forming Process of Aluminium 5083

H. Samekto and K. Roll 117

Design of SPF Dies Based on Advanced Material Behaviour Models

G. Bernhart, F. Nazaret, A. Martinier, C. Gao, D. Garriga-Majo, T. Cutard and P. Lours 123

Computer Simulation of Superplastic Forming in Restorative Dentistry

R.D. Wood, R. Curtis, J. Bonet, R. Said, A. Gil, D. Garriga-Majo and S. Odendahl 131

The Influence of Pulsating Strain Rates on the Superplastic Deformation Behaviour of Al-Alloy AA5083 Investigated by Means of Cone Test

M. Vulcan, K. Siegert and D. Banabic 139

Results of In-House Cone-Cup Testing of Low to High Temperature SPF-Alloys

W. Beck 145

A Production System Using Ceramic Die Technology for Superplastic Forming

D.G. Sanders 153

Manufacturing of Shaped Forms from Stainless Steels with Superplastic Forming

J. Romu, Y. Yagodzinsky, W. Beck and H. Hänninen 159

Constitutive Modeling of Deformation-Induced Anisotropy in Superplastic Materials	165
F.K. Abu-Farha and M.K. Khraisheh	
Hyperbolic Sine Representation of a Constitutive Equation for Superplastic Forming Grade Inconel 718	
B. Zhang, D.J. Mynors, A. Mugarra and K. Ostolaza	171
Advances in Manufacturing Superplastically Formed and Diffusion Bonded Components	
L.D. Hefti	177
Numerical Simulation of Superplastic Forming and its Microstructure Evolution	
Q.L. Jin and X. Liao	183
ISO Proposal of a "Method for Evaluation of Tensile Properties of Metallic Superplastic Materials"	
H. Watanabe, F. Ono and K. Higashi	189
On the Expanded Usage of Superplastic Forming of Aluminium Sheet for Automotive Applications	
P.A. Friedman and S.G. Luckey	199
Series Production of Automotive Body Panels in 5083-SPF using a new Press Concept	
B.J. Dunwoody	205
Progress Towards High Superplastic Strain Rate Aluminium Alloys	
R. Grimes, R.J. Dashwood, H.M. Flower, M. Jackson, S. Katsas and G. Todd	213
Superplastic Behavior of a Fine Grained AZ61 Alloy Processed by Large Strain Hot Rolling	
M.T. Pérez-Prado, J.A. del Valle and O. Ruano	221
High Temperature Deformation Behaviour of a Mg-0.8Al Alloy	
R.S. Kottada and A.H. Chokshi	227
Lowering the Heat - The Development of Reduced SPF Temperature Titanium Alloys for Aircraft Production	
P.N. Comley	233
Applying Superplastic Forming Principles to Titanium Sheet Metal Forming Problems	
W. Swale and R. Broughton	239
The Superplastic Forming Technology of Ti-6Al-4V Titanium Alloy Bellows	
K.F. Zhang, G. Wang, G.F. Wang, C.-. Wang and D.Z. Wu	247
Filaments in Superplastic Deformed SiC Particle Reinforced Aluminium Alloy Matrix Composites	
B. Zhang, Z. Wei, Y. Wang, Q. Jin and D.J. Mynors	253
Problems Encountered in Superplastic Forming of Al 5083 Parts	
B. Gershon, I. Eldror, I. Arbel and J. Milo	259
Superplastic Blow Forming of 2219 Aluminium Alloy	
R. Kaibyshev, I. Kazakulov, D. Gromov, D.R. Lesueur and T.G. Nieh	265
High Temperature Ductility and Deformation Mechanism in a 2024 Aluminium Alloy	
Y. Takayama, N. Ishikawa, H. Kato and H. Watanabe	271
Application Studies of New Process and Material for Low-Cost SPF/DB Panel Forming Technology	
S. Yajima, M. Shimanuki, T. Ogisu, S. Kimura and H. Oyama	277
Superplasticity in Commercial Al 7475	
S. Griffiths, D. Whittle, N. Ridley and R.I. Todd	283
High-Strain-Rate Superplasticity in Oxide Ceramics	
K. Hiraga, B.N. Kim, K. Morita and Y. Sakka	291
Dopant Effect on the High-Temperature Grain Boundary Sliding in Alumina	
H. Yoshida, K. Matsunaga, T. Yamamoto and Y. Ikuhara	299
Superplastic Phenomenon and Electric Properties of Sc_2O_3 Doped Zirconia-Based Ceramics	
Y. Motohashi, S. Akutsu, S. Kakita and Y. Maruyama	305
Application of Pseudo-Superplasticity to Produce $\text{TiN}/\text{Ti}_5\text{Si}_3$ and $\text{TiC}/\text{Ti}_5\text{Si}_3$ Nano Grain Composites for Micro Molding	
N. Miyano, H. Iwasa, K. Isonishi, S. Tanaka, S. Sugiyama and K. Ameyama	311
Production of γ-TiAl Sheets with Improved Superplastic Properties by Pack Rolling	
M.R. Shagiev, G.A. Salishchev, R.M. Imamov, V.M. Imayev and A.V. Kuznetsov	317
Role of Diffusion Creep in a Superplastic Zirconia-Alumina Composite	
S. Swaroop and A.H. Chokshi	323

High-Strain-Rate Superplasticity in 3mol%-Y₂O₃-Stabilized Tetragonal ZrO₂ Dispersed with 30vol% MgAl₂O₄ Spinel	329
K. Morita, B.N. Kim, K. Hiraga and Y. Sakka	
Small Dopant Effect on the Superplastic Flow and Failure in 3Y-TZP	335
K. Nakatani, H. Nagayama, H. Yoshida, T. Yamamoto and T. Sakuma	
Effect of Spinel Second Phase on High Temperature Deformation in Alumina	341
L.N. Satapathy and A.H. Chokshi	
Creep of Zirconia/Nickel Composites	347
A. Morales-Rodríguez, A. Bravo-León, A. Domínguez-Rodríguez and M. Jiménez-Melendo	
Plastic Behaviour of Nanostructured Yttria Tetragonal Zirconia Polycrystals: The Effect of Yttrium Segregation	353
C. Lorenzo, D. Gómez-García, A. Gallardo-López, A. Domínguez-Rodríguez and R. Chaim	
Effect of Yttrium on the Deformation of Nanocrystalline ZrO₂ at Elevated Temperatures	359
M. Yoshida, Y. Shinoda, T. Akatsu and F. Wakai	
Superplastic Behavior in Small Amount of Ge-Ti Co-Doped TZP	365
H. Nagayama, A. Kuwabara, H. Yoshida and T. Sakuma	
Deformation Processing, Recrystallization and Grain Boundaries in Superplastic Aluminum Alloys	373
T.R. McNelley and D.L. Swisher	
In Situ Observations of Microstructural Evolution During Deformation of Supral 100	381
Y. Huang, J.F. Humphreys and N. Ridley	
Obituary, Professor Harvey M Flower FIM FRAeS	387
The Influence of Al₃Zr Precipitation on the Superplastic Behaviour of Aluminium Alloys	389
H.M. Flower, G.J. Boyle, R.J. Dashwood and R. Grimes	
Recrystallized Grain Size in Cold-Rolled and Annealed AZ31 Wrought Magnesium Alloys Affected by Rolling Direction	395
G. Itoh, Y. Motohashi and Y. Iseno	
Producing Superplastic Ultrafine-Grained Aluminum Alloys through Severe Plastic Deformation	403
C. Xu, M. Furukawa, Z. Horita and T.G. Langdon	
Microstructural Aspects in Superplasticity of Ultrafine-Grained SPD Alloys	411
R. Valiev, R.K. Islamgaliev and N.F. Yunusova	
Superplastic Behaviour and Microstructure Evolution in a Commercial Ultra-Fine Grained Al-Mg-Sc Alloy	417
F. Musin, R. Kaibyshev, Y. Motohashi and G. Itoh	
Ultrafine-Grain Structures Produced by Severe Deformation Processing	423
P.J. Apps, C.P. Heason and P.B. Prangnell	
Fine Microstructure Production Through Sandglass Extrusion	429
Y. Wang, W.L. Lu and J.T. Hai	
Effect of Grain Size and Microstructure on Appearance of Low Temperature Superplasticity in Al-Mg Alloy	435
M. Noda, K. Funami, M. Hirohashi and M. Kobayashi	
Characterization of Submicron-Grained Ti-6Al-4V Sheets with Enhanced Superplastic Properties	441
G.A. Salishchev, O.R. Valiakhmetov, R.M. Galeev and F.H. Froes	
Achieving Superplasticity in the 7055 Aluminum Alloy	447
R. Kaibyshev, T. Sakai, I. Nikulin and F. Musin	
Superplasticity in an 7475 Aluminum Alloy Subjected to Equal Channel Angular Extrusion	453
I. Nikulin, R. Kaibyshev, T. Sakai and F. Musin	
Development of Submicrocrystalline Titanium Alloys Using "abc" Isothermal Forging	459
G.A. Salishchev, S.V. Zherebtsov, O.R. Valiakhmetov, R.M. Galeev and S.Y. Mironov	
Achievement of Low Temperature Superplasticity in a Commercial Aluminium Alloy Processed by Equal-Channel Angular Extrusion	465
F. Musin, R. Kaibyshev, Y. Motohashi and G. Itoh	
High Temperature Deformation and Crystallographic Orientation Distribution for an Al-Mg-Mn Alloy Sheet Worked by Continuous Cyclic Bending	471
Y. Takayama, T. Itoh, E. Harunari, H. Kato and N. Furushiro	

Influence of Channel Geometry on Superplasticity in Equal-Channel Angular Pressing	477
M. Kamachi, T. Fujinami, Z. Horita and T.G. Langdon	
Superplasticity of a Cu-Zn-Sn Alloy Processed by Equal-Channel Angular Pressing	483
K. Neishi, T. Uchida, N. Ashie, A. Yamauchi, K. Nakamura, Z. Horita and T.G. Langdon	
Microstructure and Superplastic Properties at Room Temperature in Zn-22Al Alloy after Equal-Channel-Angular Extrusion	489
T. Tanaka, H. Watanabe, M. Kohzu and K. Higashi	
A Nano-Crystalline Zn-Al Alloy with High Speed Superplasticity at Room Temperature and the Application for Seismic Damper	497
K. Makii, S. Furuta, K. Aoki, A. Kushibe, T. Tanaka and K. Higashi	
Superplastic Forming of 7475 Al Sheet after Friction Stir Processing (FSP)	505
M.W. Mahoney, A.J. Barnes, W.H. Bingel and C.B. Fuller	
The Dieless Drawing of High Carbon Steel	513
R. Carolan, P. Tiernan and P. Commerford	
Sandwich Panel with Aluminium Foam Core through Superplastic Diffusion Bonding	521
E. Sato, K. Kitazono, K. Kuribayashi, A. Kitajima and J. Matsushita	
Diffusion Bonding on Superplastic-Aluminium and -Magnesium Alloys	527
H. Somekawa, H. Watanabe, T. Mukai and K. Higashi	
Use of Laser(s) in the Process of Superplastic Forming and Diffusion Bonding	533
A. Jocelyn, A. Kar, M. Jonik, A. Keevil, M. Ackerman, J. Way and T. Flower	
Enhanced Foaming of Cellular Metals by Internal Stress Superplasticity	541
K. Kitazono, E. Sato and K. Kuribayashi	