

Table of Contents

Preface

National Scientific Committee

In Memoriam

International Scientific Committee

Plenary

Void Formation in the Growing Scale Induced by the Divergence of the Diffusive Ionic Flux in High Temperature Oxidation of Metals

T. Maruyama, M. Ueda and K. Kawamura

1

Diffusion in Metallic Elements and Intermetallics

H. Mehrer and S.V. Divinski

15

Chapter I Diffusion and Alloys

Selected Observations in Phase Constituents, Growth Kinetics and Microstructural Development of Aluminides in U-Mo vs. Al and 6061 Diffusion Couples Annealed at 600°C

E. Perez, D.D. Keiser and Y.H. Sohn

41

Diffusion in Metal Dusting Processes

D.J. Young, M.A.A. Motin and J. Zhang

51

Isotope Fractionation due to Sedimentation of Atoms in Centrifuged Indium-Lead Alloy

M. Ono, Y. Iguchi, S. Okayasu, F. Esaka, K. Kobayashi, T. Hao, R. Bagum, T. Osawa, K. Fujii, E. Nakamura and T. Mashimo

63

Effect of a Low-Concentration H₃PO₄ Solution Application on High-Temperature Behaviour of Ti and Ti-Al Alloys

S.Y. Brou, G. Bonnet and J.L. Grosseau-Poussard

69

Structural Investigations of Solidification and Heat Treatments Influence on High Alloyed Cast Irons Grades with Nb-V-Ti Additions

J. Lecomte-Beckers and J. Tchoufang Tchuindjang

77

Influence of Beta Stability on Hydrogen Diffusion in Various Beta Titanium Alloys

H.J. Christ and P. Schmidt

87

Grain Boundary Diffusion of Ni in Ultra-Fine Grain Copper-Lead Alloy Produced by Equal Channel Angular Pressing

J. Ribbe, G. Schmitz, Y. Estrin and S.V. Divinski

95

Verification of a Commercial CALPHAD Database for Re and Ru Containing Nickel-Base Superalloys

R. Rettig, A. Heckl, S. Neumeier, F. Pyczak, M. Göken and R.F. Singer

101

The Effect of Austenite Grain Size on the Growth of Different Ferrite Morphologies in a Nb-Microalloyed Steel

M. Esmailian

109

Surface Alloying of AISI H13 Steel during Electrical Discharge Machining (EDM)

G.P. Rodriguez, J. Simao and G. Herranz

119

Thermal Stability and Creep Behaviour of MgNiYCe-Rich Mischmetal Alloys Processed by a Powder Metallurgy Route

P. Pérez, K. Milicka, J.M. Badía, G. Garcés, J.M. Antoranz, S. González, F. Dobes and P. Adeva

127

A Methodology to Deduce the Microstructural Spatial Deformation of Polycrystalline Structures: Application to the Alloy 600

A. Clair, M. Foucault, J.M. Salazar, V. Vignal, E. Finot and L. Markey

137

Diffusion of ⁶⁵Zn in AZ91 and QE22 Alloys with Saffil Reinforcement-Influence of Interfaces Matrix/Saffil

I. Stloukal and J. Čermák

145

Evolution of Precipitate Depleted Zones in Mg-Based Alloys Strengthened by Precipitation Hardening	
A. Katsman, A. Gorny, D. Shepelev and M. Bamberger	153
Influence of Interstitials Content on the Diffusion of Niobium in Alloy 718	
B. Ter-Ovanessian, C. Berrest, J. Deleume, J.M. Cloué and E. Andrieu	161
Interrelation between Hydrogen Desorption Kinetics and Structure of (Mg₂Ni)H_x and Hydrogenated Eutectic(Mg/Mg₂Ni)H_y	
J. Cermak and L. Král	167
Microstructure of the Passive Layer Formed on Different Austenitic Stainless Steels Implanted with Molybdenum	
C.M. Abreu, M.J. Cristóbal, R. Figueroa, X.R. Nóvoa, G. Pena and M.C. Pérez	175
Synthesis and Characterization of a Porous Silicon Filter with Si₃N₄ Whiskers	
M. Wong-Sifuentes, M. Nanko and J. Lira-Olivares	185
Effect of the Si Additions on the Mechanical Behaviour and High-Temperature Performance of Hydrogen Sintered 434L Stainless Steels	
A. Bautista, F. Velasco and A. González-Centeno	195
Hydrogen Embrittlement of High Strength Steels	
J. Sanchez, J. Fullea, C. Andrade and P. de Andres	203
Grain Boundary Diffusion of Fe in High-Purity Copper	
J. Ribbe, G. Schmitz and S.V. Divinski	211
Investigation of Phase Transformation of Forged Steel Cold Rolls due to Heat Affecting and Prevent its Failure	
A.A. Mottahedi	219

Chapter II Diffusion and Coatings

Diffusion Enhanced Rumpling Associated with Martensitic Transformation upon Cycling of Aluminide Bond-Coats	
B. Bouchaud, J. Balmain and F. Pedraza-Diaz	227
Diffusion of a Corroding Electrolyte through Defective Electroplated Ceria Based Coatings	
S. Poupard, F. Pedraza-Diaz and J. Creus	235
Long Term Diffusion Studies in Fe Aluminide Coatings Deposited by Slurry Application on Ferritic Steel	
A. Agüero, V. González and M. Gutiérrez	243
Scanning Kelvin Probe Study on the Stability of the Steel/Coating Interfaces Contaminated by Soluble Salts	
D. de la Fuente, M. Rohwerder, B. Chico and M. Morcillo	253
Diffusion Aluminide Coatings Using Spherical Micro-Sized Aluminium Particles	
M. Juez-Lorenzo, V. Kolarik, H. Fietzek and M. Anchústegui	261
Numerical Determination of Intrinsic Diffusion Coefficient of Aluminide Coatings on Metals	
B. Wierzba, S. Chevalier, O. Politano and M. Danielewski	269
Implications of Diffusion on the Composition and Microstructures of Platinum Modified Aluminide Coatings on CMSX-4 Single Crystal Superalloy	
F. Pedraza-Diaz	277
Post-Discharge Nitriding: Mathematical Modeling and Numerical Simulation of the Layer Growth	
F. Castillo, J. Oseguera-Peña, A. Fraguera and J.A. Gómez	285
Study of the Role of Small Additions of Zr in the CVD- FBR Aluminization Process	
L. Sánchez, F.J. Bolívar, M.P. Hierro and F.J. Pérez	293

Chapter III Diffusion and Electronic Materials

Magnetic Coupling in La_{0.7}Ca_{0.3}MnO₃/YBa₂Cu₃O₇/La_{0.7}Ca_{0.3}MnO₃ Trilayers	
N.M. Nemes, C. Visani, J. Garcia-Barriocanal, F.Y. Bruno, Z. Sefrioui, D. Arias, C. Leon, M. Garcia-Hernandez, S.G.E. Te Velthuis, A. Hoffmann and J. Santamaría	303
The Electrolytic Actuator-An Effect Dominated by Dissipative Currents	
H. Temmen and P. Caracciolo	311

Sedimentation of Impurity Atoms in InSb Semiconductor under a Strong Gravitational Field	
Y. Iguchi, M. Ono, S. Okayasu and T. Mashimo	319
Influence of Pulsed Magnetic Field on the Al-Heterodiffusion in α-Fe	
A.V. Pokoev and M.A. Verjakovskaya	323
Atom Redistribution during co-Doped Amorphous Silicon Crystallization	
A. Portavoce, D. Mangelinck, R. Simola, R. Daineche and J. Bernardini	329
First Study of Oxygen Diffusion in a ZnO - Based Commercial Varistor	
A.C.S. Sabioni, A.M.J.M. Daniel, R. Metz, A.M. Huntz and F. Jomard	339
Dynamics of Mobile Oxygen Ions in Disordered Pyrochlore-Type Oxide-Ion Conductors	
M.R. Díaz-Guillén, K.J. Moreno, J.A. Díaz-Guillén, A.F. Fuentes, J. Garcia-Barriocanal, J. Santamaría and C. Leon	347

Chapter IV Diffusion and Intermetallics

Formation of Amorphous Graded Structure in Bi_3Pb_7 Intermetallic Compounds under Strong Gravitational Field	
T. Mashimo, Y. Iguchi, R. Bagum, T. Sano, S. Takeda, S. Kimura, O. Sakata, M. Ono, S. Okayasu, T. Tsurui and K. Hiraga	357
Triple-Defect B2 Binary Intermetallics: Bragg-Williams Solution and Monte Carlo Simulations	
A. Biborski, L. Zosiak and R. Abdank-Kozubski	361
Characterization of Intermetallic Layer with Nanoresolution Using X-Ray Standing Wave Technique	
C. Cserhádi, Z. Erdélyi, Z. Balogh, L. Daróczi, A. Csik, G.A. Langer, M. Varga, I. Zizak, A. Erko and D.L. Beke	369
Diffusion of Titanium and Nickel in B2 NiTi	
S.V. Divinski, I. Stloukal, L. Král and C. Herzig	377

Chapter V Diffusion and Oxidation Processes

Growth Mechanism vs Matter Transport in Thermally Growing Oxides on High Temperature Materials: A Brief Survey Based on the Case Study of Alumina Formers	
J. Jedlinski	385
Characterisation of the Oxide/Metal Interface of Fluorine Treated Titanium Aluminides	
P.J. Masset, M. Laurent and M. Schütze	397
Diffusion of Oxygen in Thermally Grown Oxide Scales	
S. Chevalier	405
Evaluation of Si Coating on Ferritic Steels by CVD-FBR Technology in Steam Oxidation	
F.J. Bolívar, L. Sánchez, M.P. Hierro and F.J. Pérez	413
Graded Nitrogen Ingress in FCC Metallic Structures and the Related Microstructures and High Temperature Oxidation Behaviour	
F. Pedraza-Díaz, J.L. Grosseau-Poussard, J.F. Dinhut, J. Balmain and G. Bonnet	421
On the Mechanism of Cu_2O Oxidation at High Temperatures	
Z. Grzesik and M. Migdalska	429
Studies of the Effectiveness of Certain High Performance Coatings in Preventing Hot Corrosion Degradation of Ti-Aluminide Alloys	
D. Tomasz, A. Wilson, H.G. Ahmad and P.K. Datta	437
A Thermodynamic Approach of the Mechano-Chemical Coupling during the Oxidation of Uranium Dioxide	
N. Creton, V. Optasanu, T. Montesin, S. Garruchet and L. Desgranges	447
Oxidation Behaviour of Stainless Steel Matrix with TiC and $\text{TiC}+\text{TiB}_2$ SHS Powders in a Thermal Spray Process	
J. Fernández, A. Isalgue, I.G. Cano and J.M. Guilemany	455
Behaviour of Aluminide Diffusion Coatings on HCM12-A Steel by Al/Ce and Al/La CVD-FBR in Oxidation.	
L. Sánchez, F.J. Bolívar, M.P. Hierro and F.J. Pérez	461

The Influence of CVD-FBR Coatings on HCM12 Corrosion Behaviour under Molten Salt Conditions	
J. Nieto, M.P. Hierro, F.J. Bolívar and F.J. Pérez	469
Metal Dusting Corrosion of 9Cr-1Mo Steel in Propane-Butane Gas Mixture	
Z. Grzesik, M. Danielewski and S. Mrowec	477
Influence of the Processing Parameters on the Nature of Oxides Formed on Sintered Stainless Steels during High-Temperature Exposures	
A. Bautista, C. Moral and F. Velasco	485
Establishment of Thermally Grown Oxides upon the Early Oxidation Stages of Ni20Cr and Ni30Cr	
B. Bouchaud, L. Douminge and F. Pedraza-Diaz	493
An Insight on the Influence of Ion Implantation on the Pitting Corrosion Resistance of AISI 430 Stainless Steel	
C.M. Abreu, M.J. Cristóbal, P. Merino, G. Pena and M.C. Pérez	501

Chapter VI Diffusion and Oxides

Oxygen Uptake and Diffusion in Mayenite	
M. Kilo, S. Swaroop and M. Lerch	511
Strong-Gravity Effect on Twinned $Y_1Ba_2Cu_3O_{7-x}$ Single Crystal	
R. Bagum, S. Okayasu, Y. Iguchi, M. Ono and T. Mashimo	517
Study of Oxygen Diffusion in Polycrystalline ZnO by SIMS	
A.C.S. Sabioni, A.M.J.M. Daniel, A.M. Huntz, W.B. Ferraz and F. Jomard	523
Oxygen and Silicon Diffusion in Silica under Varying Ambient Conditions	
K. Sunder and H. Bracht	531
The Oxide Scale Growth Mechanism on Fe20Cr5Al+RE Alloy in SO_2+O_2	
J. Jedlinski, Z. Żurek, M. Homa, G. Smoła and J. Camra	541
Determination of Diffusion Coefficients of Oxygen Vacancies in $La_{0.58}Sr_{0.4}Co_{0.2}Fe_{0.8}O_{3-\delta}$ Perovskite Type Oxides	
D. Schlehuber, E. Wessel, L. Singheiser and T. Markus	551

Chapter VII Diffusion and Stresses

Interface Diffusion in Cu Processed by Means of Surface Mechanical Attrition Treatment	
Z.B. Wang, K. Wang, K. Lu, G. Wilde and S.V. Divinski	557
Li Conductivity of Nanocrystalline $Li_4Ti_5O_{12}$ Prepared by a Sol-Gel Method and High-Energy Ball Milling	
W. Iwaniak, J. Fritzsche, M. Zukalová, R. Winter, M. Wilkening and P. Heitjans	565

Chapter VIII Diffusion in Thin Films

Thin Film Dissolution into Semi-Infinite Substrates: Surprising Interface Kinetics and Dissolution Modes	
Z. Erdélyi, C. Girardeaux, D.L. Beke, J. Bernardini, A. Portavoce, G.L. Katona, Z. Balogh and A. Rolland	573
On the Formation of Unusual Diffusion Profiles in $Cd_xZn_{1-x}Te$ Crystals after Implantation of Different Elements	
H. Wolf, F. Wagner, J. Kronenberg and T. Wichert	587
Evolution of Concentration Profiles and Diffusion Paths in Single-Phase Multicomponent Multilayered Assemblies	
K.N. Kulkarni and M.A. Dayananda	593
Unusual Behaviour of the Dissolutions Kinetics of one Monolayer of Si in Cu(001)	
B. Lalmi, C. Girardeaux, A. Portavoce, J. Bernardini and B. Aufray	601

Chapter IX Diffusion in Glasses and Liquids

Self Diffusion in Liquid Titanium: Quasielastic Neutron Scattering and Molecular Dynamics Simulation	
A. Meyer, J. Horbach, O. Heinen, D. Holland-Moritz and T. Unruh	609
Alkaline-Earth Diffusion in Mixed Cation Glasses	
M. Grofmeier, F.V. Natrup and H. Bracht	615

Chapter X Diffusion in Nanomaterials

Diffusion in Nanostructured Materials	
S.V. Divinski	623
Emission Mössbauer Spectroscopy of Grain Boundaries in Poly- and Nanocrystalline Metals	
V.V. Popov	633
Grain Boundary Diffusion in Recrystallizing Nanocrystalline Materials	
L. Klinger, Y. Amouyal, S.V. Divinski and E. Rabkin	641
Formation of a Nano-Hole via Oxidation of Metal Nanoparticles	
R. Nakamura, H. Nakajima and H. Mori	649
Surface-Sandwich Segregation Phenomena in Bimetallic Ag-Ni and Pd-Ni Nanoparticles: A Molecular Dynamics Study	
E.V. Levchenko, A.V. Evteev, I.V. Belova and G.E. Murch	657
Composition Effect on Shrinkage of Hollow Binary Alloy Nanospheres	
A.V. Evteev, E.V. Levchenko, I.V. Belova and G.E. Murch	665
Shrinkage of Hollow Nanoparticles of Oxides of Cu and Ni at High Temperatures	
R. Nakamura, H. Nakajima and H. Mori	673
Essay on Techniques & Physics of Some Diffusion-Controlled Processes in Materials: Relevance to Nanofabrication Applications	
Y.S. Nechaev and A. Öchsner	679

Chapter XI Fundamentals in Diffusion

Impact of Carbon on the Diffusion of Donor Atoms in Germanium	
H. Bracht, S. Brotzmann and A. Chroneos	689
Diffusion in Isotope Heterostructures Investigated by Neutron Reflectometry	
E. Hüger, J. Stahn, U. Geckle, M. Bruns and H. Schmidt	697
Atomic Diffusion and its Relation to Thermodynamic Forces in Al-Ni Melts	
A. Griesche, B. Zhang, J. Horbach and A. Meyer	705
Solute Diffusion in Grain Boundaries – Outside the Scope of Fisher Model	
A. Rodin, L. Klinger and B.S. Bokstein	711
Concentration Characteristics of Diffusion-Induced Recrystallization	
G. Schmitz, B. Kruse, D. Baither and T.H. Kim	719
Jump Frequencies of Cd Tracer Atoms in $L1_2$ Lanthanide Gallides	
X. Jiang, M.O. Zacate and G.S. Collins	725
Computer Simulation of Diffusion in Dilute Al-Fe Alloys	
M. Mendelev, A. Rodin and B.S. Bokstein	733
Following the First Steps of UV Degradation of High Density Polyethylene by Fluorescence Spectroscopy	
L. Doumingé, S. Mallarino, X. Feaugas and J. Bernard	741
First-Principle Calculation of Monovacancy and Divacancy Interactions with Atomic Oxygen in Nickel: Thermal Expansion Effects	
C. Mijoule, E.H. Megchiche, E. Andrieu and D. Monceau	747
Motion of Cadmium Tracer Atoms in $Al_{11}R_3$ Phases (R=La,Ce,Pr)	
S. Lage and G.S. Collins	755
Determination of Grain Boundary Diffusion Coefficients in C-Regime by Hwang-Balluffi Method: Silver Diffusion in Pd	
Z. Balogh, Z. Erdélyi, D.L. Beke, A. Portavoce, C. Girardeaux, J. Bernardini and A. Rolland	763
Oxygen Diffusion and Surface Exchange in Yttria-Stabilized Zirconia and Gadolinia-Doped Ceria Ceramics at Low Temperatures	
K. Kowalski	769

Doping Effect in Nickel Oxide

Z. Jurasz, K. Adamaszek, R. Janik, Z. Grzesik and S. Mrowec

775