Structure and Properties of Interfaces in Materials
Structure and Properties of Interfaces in Materials

Symposium held December 2-5, 1991, Boston, Massachusetts, U.S.A.

EDITORS:

William A.T. Clark
Ohio State University, Columbus, Ohio, U.S.A.

Ulrich Dahmen
National Center for Electron Microscopy, Lawrence Berkeley Laboratory, Berkeley, California, U.S.A.

Clyde L. Briant
General Electric, Schenectady, New York, U.S.A.

MRS MATERIALS RESEARCH SOCIETY
Pittsburgh, Pennsylvania
Contents

PREFACE xv

MATERIALS RESEARCH SOCIETY SYMPOSIUM PROCEEDINGS xvi

PART I: INTERFACIAL STRUCTURE AND DEFECTS

•ACCOMMODATION OF SUBSTRATE STEPS IN THE GROWTH OF CoSi₂
  ON (111) Si
  A.C. Daykin, C.J. Kiely, and R.C. Pond

TILTS IN THIN STRAINED LAYERS 17
  Richard Beanland

THE EFFECT OF INITIAL GROWTH CONDITIONS ON THE TILTING
  OF LATTICE PLANES IN InP-ON-GaAs HETEROSTRUCTURES 23
  Ferenc Riesz, K. Lischka, K. Rakennus, T. Hakkarainen, A. Pesek,
  and E. Koppensteiner

•DESCRIPTION OF THE ATOMIC POSITIONS AROUND INTERFACIAL
  LEDGES IN TERMS OF THE SOMIGLIANA DISLOCATION MODEL 29
  R. Bonnet and M. Loubradou

ATOMIC STRUCTURE OF INTERNAL INTERFACES IN A Ti₃Al-TiAl
  TWO-PHASE ALLOY 41
  J.M. Penisson, R. Bonnet, M. Loubradou, and C. Derder

PREFERRED ORIENTATIONS IN METAL/NON-METAL INTERFACE
  SYSTEMS 47
  K. McCafferty, A. Soper, J. Shirokoff, and U. Erb

•ELASTIC PROPERTIES OF STEPS AT INTERPHASE BOUNDARIES 53
  G.J. Shiflet

DYNAMICS AND ATOMIC STRUCTURE OF MARTENSITE-AUSTENITE
  INTERFACES 65
  S. Chen, P.C. Clapp, and J.A. Rifkin

THE PROPERTIES OF TWINSING DISLOCATIONS IN ALPHA-
  TITANIUM SIMULATED WITH A MANY-BODY INTERATOMIC
  POTENTIAL 73
  David J. Bacon and Anna Serra

EVALUATION OF THE INTERFACE STRUCTURE DURING STRANSKI-
  KRASTANOV GROWTH OF Ge(Si) ON Si(001) 79
  M. Albrecht, H.P. Strunk, P.O. Hansson, and E. Bausen

MISFIT DISLOCATION NUCLEATION SITES AND METASTABILITY
  ENHANCEMENT OF SELECTIVE Si₃N₄ GE/SI GROWN BY RAPID
  THERMAL CHEMICAL VAPOR DEPOSITION 85
  C.W. Liu, J.C. Sturm, P.V. Schwartz, and E.A. Fitzgerald

LOMER DISLOCATIONS IN (001) GaSb/GaAs HETEROSTRUCTURE 91
  André M. Rocher, Joon M. Kang, and Anne Ponchet

*Invited Paper
<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEFECT STRUCTURES IN EPITAXIALLY GROWN InAs FILMS ON InP SUBSTRATES</td>
<td>95</td>
</tr>
<tr>
<td>A.K. Ballal, L. Salamanca-Riba, D.L. Partin, J. Heremans,</td>
<td></td>
</tr>
<tr>
<td>L. Green, and B.K. Fuller</td>
<td></td>
</tr>
<tr>
<td>POINT DEFECT DETECTOR STUDIES OF OXIDIZED SILICON</td>
<td>101</td>
</tr>
<tr>
<td>H.L. Meng, K.S. Jones, and S. Prussin</td>
<td></td>
</tr>
<tr>
<td>MICROSTRUCTURAL BEHAVIOR OF POLY-Si IMPLANTED WITH OXYGEN</td>
<td>107</td>
</tr>
<tr>
<td>N. David Theodore, WenLing M. Huang, and Peter A. Crozier</td>
<td></td>
</tr>
<tr>
<td>CHARACTERIZATION OF P+-IMPLANTED SILICON</td>
<td>113</td>
</tr>
<tr>
<td>N. David Theodore, Lynnita Knoch, Jim Christiansen, and M. Pan</td>
<td></td>
</tr>
<tr>
<td>PRINCIPLES AND PERFORMANCE OF A PC-BASED PROGRAM FOR SIMULATION</td>
<td>119</td>
</tr>
<tr>
<td>OF GRAZING INCIDENCE X-RAY REFLECTIVITY PROFILES</td>
<td></td>
</tr>
<tr>
<td>M. Wormington, D.K. Bowen, and B.K. Tanner</td>
<td></td>
</tr>
<tr>
<td><strong>PART II: GRAIN BOUNDARIES</strong></td>
<td></td>
</tr>
<tr>
<td>THE STRUCTURE AND PROPERTIES OF GRAIN BOUNDARIES IN Ni$_3$Al</td>
<td>127</td>
</tr>
<tr>
<td>M.J. Mills, S.H. Goods, and S.M. Foiles</td>
<td></td>
</tr>
<tr>
<td>STRUCTURE OF GRAIN BOUNDARIES IN Ll$_2$ ALLOYS AT FINITE TEMPERATURES</td>
<td>139</td>
</tr>
<tr>
<td>EFFECTS OF DEVIATIONS FROM STOICHIOMETRY</td>
<td></td>
</tr>
<tr>
<td>M. Yan, V. Vitek, and G.J. Ackland</td>
<td></td>
</tr>
<tr>
<td>IN-SITU TEM OBSERVATION OF A STRUCTURAL CHANGE IN A NEAR Σ=3-TWIST</td>
<td>145</td>
</tr>
<tr>
<td>BOUNDARY IN ORDERED Cu$_2$Au</td>
<td></td>
</tr>
<tr>
<td>F.D. Tichelaar and F.W. Schapink</td>
<td></td>
</tr>
<tr>
<td>DISLOCATION DISSOCIATION IN THE Σ13 GRAIN BOUNDARY IN SILICON</td>
<td>151</td>
</tr>
<tr>
<td>Laurent Sagalowicz, Richard Beanland, and William A.T. Clark</td>
<td></td>
</tr>
<tr>
<td>HIGH RESOLUTION ANALYSIS OF STRUCTURE AND CHEMISTRY OF GRAIN</td>
<td>157</td>
</tr>
<tr>
<td>BOUNDARIES IN SILICON</td>
<td></td>
</tr>
<tr>
<td>M.J. Kim and R.W. Carpenter</td>
<td></td>
</tr>
<tr>
<td>COMBINED EXPERIMENTAL AND THEORETICAL DETERMINATION OF THE ATOMIC</td>
<td>163</td>
</tr>
<tr>
<td>STRUCTURE OF THE (310) TWIN IN Nb</td>
<td></td>
</tr>
<tr>
<td>Geoffrey H. Campbell, Wayne E. King, Stephen M. Foiles, Peter</td>
<td></td>
</tr>
<tr>
<td>Gumbsch, and Manfred Rühle</td>
<td></td>
</tr>
<tr>
<td>GRAIN BOUNDARY STRUCTURE AND MORPHOLOGY IN 30° &lt;100&gt; TRICRYSTAL</td>
<td>171</td>
</tr>
<tr>
<td>FILMS OF Al</td>
<td></td>
</tr>
<tr>
<td>N. Thangarajan and U. Dahmen</td>
<td></td>
</tr>
<tr>
<td>THE INFLUENCE OF GRAIN BOUNDARY INCLINATION ON THE STRUCTURE AND</td>
<td>177</td>
</tr>
<tr>
<td>ENERGY OF Σ3 TWIN BOUNDARIES IN COPPER</td>
<td></td>
</tr>
<tr>
<td>Ulrich Wolf, F. Ernst, T. Muschik, M.W. Finnis, and H.F. Fischmeister</td>
<td></td>
</tr>
<tr>
<td>RECONSTRUCTION OF A HIGH-ANGLE TWIST GRAIN BOUNDARY BY GRAND-CANONICAL</td>
<td>183</td>
</tr>
<tr>
<td>SIMULATED QUENCHING</td>
<td></td>
</tr>
<tr>
<td>S.R. Phillpot and J.M. Rickman</td>
<td></td>
</tr>
</tbody>
</table>

*Invited Paper*
PART III: INTERFACE TRANSFORMATIONS AND REACTIONS

*PHASE TRANSITIONS AT INTERNAL INTERFACES 191
Craig Rottman

GRAIN BOUNDARY TRANSFORMATIONS IN BI-DOPED COPPER 201
Elsie C. Urdaneta, David E. Luzzi, and Charles J. McMahon, Jr.

SHAPE TRANSFORMATIONS OF Ge PRECIPITATES IN AI 207
P. Lours, K.H. Westmacott, and U. Dahmen

THE DETERMINATION OF INTERFACIAL STRUCTURE AND PHASE
TRANSITIONS IN Al/Cu AND Al/Ni INTERFACES BY MEANS OF
SURFACE EXTENDED X-RAY ABSORPTION FINE STRUCTURE 211
E.V. Barrera and S.M. Heald

*THE ROLE OF SURFACE STRESS IN THE FACETING OF STEPPED
Si(111) SURFACES 219
Ellen D. Williams, R.J. Phaneuf, N.C. Bartelt, W. Święch, and
E. Bauer

SURFACE RECONSTRUCTION OF PLATINUM AND GOLD AND THE
EMBEDDED ATOM MODEL 229
Michael I. Hafiel

ATOMIC STRUCTURE OF THE SnO2 (110) SURFACE 235
T.J. Godin and John P. LaFemina

THE INTERACTION OF BULK DEFECTS WITH SURFACE
RECONSTRUCTIONS 241
D.N. Dunn, L.D. Marks, and K.L. Merkle

THERMODYNAMIC AND KINETIC CHARACTERISTICS OF VARIATIONS
IN SHAPES OF RIDGES FORMED ON [100] LITHIUM FLUORIDE
SURFACES 247
J.W. Bullard, A.M. Glaeser, and Alan W. Searcy

ANALYSIS OF FACETED GROWTH HILLOCKS IN MOCVD GROWN
EPITAXIAL HgCdTe ON GaAs WITH A NUCLEAR MICROPROBE 253
David N. Jamieson, S.P. Dooley, S.P. Russo, P.N. Johnson,
G.N. Pain, and P.W. Leech

*IN-SITU TRANSMISSION ELECTRON MICROSCOPY OF THE ETCHING
OF SILICON (111) SURFACES BY OXYGEN 259
J.M. Gibson and F.M. Ross

STUDY OF THERMAL OXIDE SOLID-STATE REACTION ON GaAs
SURFACES 263
Z. Lu, D. Chen, R.M. Osgood, Jr., and D.V. Podlesnik

*REACTIONS AT SOLID INTERFACES 269
R. Sinclair, D.H. Ko, T.J. Konno, and T.P. Nolan

PHASE FORMATION AT Pd/Si1-xGe, INTERFACES 273
A. Buxbaum, M. Eizenberg, A. Raizman, and F. Schöffler

DISSOLUTION AND GROWTH KINETICS OF SMALL CRYSTALS IN
LIQUIDS 279
Michael J. Uttormark, Michael O. Thompson, and Paulette Clancy

*Invited Paper
COARSENING OF A POPULATION OF PRECIPITATES IN A SOLID 285
J.P. Lavin and G.A. Hawkins

DIFFUSION LIMITED INTERFACE KINETICS IN MULTICOMPONENT SYSTEMS 291
William D. Hopfe and J.E. Morral

THE STABILIZATION OF FACE-CENTERED-CUBIC TITANIUM 297
Alan F. Jankowski and Mark A. Wall

PART IV: INTERFACIAL STRUCTURE/PROPERTIES RELATIONSHIP 305

CORRELATIONS BETWEEN THE STRUCTURE, ENERGY AND DIFFUSIVITY OF GRAIN AND INTERPHASE BOUNDARIES

GRAIN BOUNDARY STRUCTURE CONTROL FOR INTERGRANULAR STRESS-CORROSION RESISTANCE 311
G. Palumbo, P.J. King, P.C. Lichtenberger, K.T. Aust, and U. Erb

STRUCTURAL AND ELECTRICAL PROPERTIES OF ZnO FILMS DEPOSITED ON GaAs SUBSTRATES BY RF MAGNETRON SPUTTERING 317
Hong Koo Kim and Michelle Mathur

IMPEDANCE SPECTROSCOPIC STUDY OF ZINC OXIDE VARISTORS 323
A. Sadhu, G. Banerjee, M.J. Patni, and T.R. Ramamohan

EFFECT OF Yb DIFFUSION BARRIERS ON THE PROPERTIES OF In/n-Hg1-xTe CONTACTS 329
Patrick W. Loech, Geoffrey K. Reeves, Yuan H. Li, and Martyn H. Kibbel

STUDY OF THE DEFECT LEVELS AND INTERFACE PROPERTIES OF CdTe AND CdS POLYCRYSTALLINE THIN FILMS 335
F. Abou-Elfotouh, S. Ashour, S.A. Alkuhaimi, J. Zhang, D.J. Dunlavy, and L.L. Kazmerski

STUDY OF MAGNETIC PROPERTIES OF COBALT FILMS GROWN ON GaAs (110) AND Au (111) SUBSTRATES USING FERROMAGNETIC RESONANCE 341
K.L. Hogue, C. Kota, and H.M. Naik

SUBSTRATE SURFACE EFFECTS ON THE PROPERTIES OF SPUTTER-DEPOSITED AND LASER-IRRADIATED FILMS 347
A.J. Pedraza, M.J. Godbole, and L. Romana

PART V: INTERFACES IN DEFORMATION 357

*THE EFFECT OF GRAIN BOUNDARY CHEMISTRY ON THE SLIP TRANSMISSION PROCESS THROUGH GRAIN BOUNDARIES IN Ni3Al 357
I.M. Robertson, T.C. Lee, Raja Subramanian, and H.K. Birnbaum

SLIP TRANSFER ACROSS INTERPHASE BOUNDARIES IN DIRECTIONALLY SOLIDIFIED \( \beta+(\gamma+\gamma') \)Ni-Fe-Al ALLOYS 369
A. Misra and R. Gibala

*Invited Paper
FRACTURE STRENGTHS OF INDIVIDUAL GRAIN BOUNDARIES IN Ni3Al USING A MINIATURIZED DISK BEND TEST
Douglas E. Meyers and Alan J. Ardel  
375

AN ATOMISTIC STUDY OF HYDROGEN EFFECTS ON THE FRACTURE OF TILT BOUNDARIES IN NICKEL
N.R. Moody and S.M. Foiles  
381

GRAIN-BOUNDARY-MEDIATED FAILURE IN POLYCRYSTALS
C.S. Nichols and D.A. Smith  
387

CHARACTERIZATION OF PLASTICITY IN BIMATERIAL INTERFACE FRACTURE BY STM
Clifford P. Warner and Dawn A. Bonnell  
393

DIFFUSION-CONTROLLED DECOHESION USING A Cu-Sn ALLOY AS A MODEL SYSTEM
Dafni Bikas and Charles J. McMahon, Jr.  
399

THE DIRECTIONALITY OF INTERFACIAL CRACKING IN BIMATERIALS
Jian-Sheng Wang and Glenn E. Beltz  
405

PART VI: INTERFACIAL SEGREGATION AND DIFFUSION

*HYDROGEN SEGREGATION TO INTERFACES
A.D. Marwick, Joyce C. Liu, W. Krakow, and R.D. Thompson  
413

ANALYSIS OF OXYGEN DISTRIBUTION IN INTERFACES IN SiC WHISKER REINFORCED Si3N4-BASED COMPOSITES
K. Das Chowdhury, R.W. Carpenter, and W. Braue  
421

THE EFFECT OF TRACE ELEMENT SEGREGATION TO Fe/SAPPHIRE INTERFACES
D.P. Pope and M.A. Smith  
427

EFFECTS OF RARE-EARTH ON PROPERTIES OF HEAT-RESISTANT STEELS AND ITS INTERACTION WITH INTERFACES
Xu Jihua, Han Guichun, Lu Guorong, He Shuping, and Jin Dasheng  
433

EFFECTS OF CATION SEGREGATION AT OXIDE GRAIN BOUNDARIES ON GRAIN BOUNDARY DIFFUSION AND OXIDATION KINETICS OF NICKEL
C.M. Cotell, M.J. Bennett, and A.J. Garratt-Reed  
439

AN ATOM PROBE FIELD ION MICROSCOPE INVESTIGATION OF THE ROLE OF BORON IN PRECIPITATES AND AT GRAIN BOUNDARIES IN NiAl
Raman Jayaram and M.K. Miller  
445

TEM AND HREM INVESTIGATION OF THE PRECIPITATION OF COBALT AND NICKEL IN POLYCRYSTALLINE SILICON
H.J. Möller, Juyong Chung, and Lan Huang  
451

COMPARISON OF THERMALLY- AND IRRADIATION-INDUCED GRAIN BOUNDARY SEGREGATION IN AUSTENITIC STAINLESS STEELS
Edward A. Kenik  
457

KINETICS OF DOPANT DISTRIBUTION IN LPE GROWN GaAs EPI-LAYER
Y. Okamoto, Y. Akagi, and M. Koba  
463

*Invited Paper
PART VII: INTERFACES IN THIN FILMS AND MULTILAYERS

*OBSERVATIONS OF GRAIN GROWTH IN THIN FILMS
  D.A. Smith, S.J. Townsend, and C.S. Nichols

*INTERFACIAL STRUCTURE AND EVOLUTION IN MESOTAXIAL CoSi$_2$/Si HETEROSTRUCTURES
  R. Hull, Y.F. Hsieh, A.E. White, and K.T. Short

MORPHOLOGY OF Si/TUNGSTEN-SILICIDE/Si INTERLAYERS
  N. David Theodore, F. Secco d’Aragona, and Scott Blackstone

SYNTHESIS AND CHARACTERIZATION OF Mo(Ta)/MoSi$_x$ MICROLAMINATES
  H. Kung, B.M. Vyletel, and A.K. Ghosh

*Invited Paper
MICROSTRUCTURE AND PROPERTIES OF MoSi$_2$/Nb INTERFACES WITH AND WITHOUT ALUMINA COATING 567
L. Xiao and R. Abbaschian

EFFECT OF AN INTERFACIAL Ti LAYER ON THE FORMATION OF CoSi$_x$ ON Si 575

THE EVOLUTION OF TITANIUM-SILICON INTERFACES AS MONITORED BY X-RAY DIFFRACTION 581
Thomas Novet, John McConnell, and David C. Johnson

CoSi$_2$ FORMATION THROUGH Co/Ti MULTILAYER REACTING WITH Si-(100) SUBSTRATES 587
Feng Hong, Bijoy Patnaik, and George A. Rozgonyi

XAFS STUDIES OF Cr-Si-O INTERFACES WITH Al AND POLYIMIDE BY USING SYNCHROTRON RADIATION 593
Kiyoshi Ogata, Asao Nakano, Yasunori Narizuka, Takayoshi Watanabe, and Tetsuya Yamazaki

INTERFACIAL STRUCTURES OF MoSi$_2$-Mo$_5$Si$_3$ FUTECTIC ALLOYS 599
H. Kung, H. Chang, and R. Gibala

VARIABLE ANGLE SPECTROSCOPIC ELLIPSOOMETRIC CHARACTERIZATION OF POLYSILICON THIN FILM MULTILAYER STRUCTURES 605
Paul G. Snyder, Yi-Ming Xiong, John A. Woollam, and Eric R. Krosche

COMPARISON OF DIFFERENT THICKNESS MEASUREMENTS OF OXIDE FILMS ON SILICON 611
Shou-Chen Kao and Robert H. Doremus

THE EFFECT OF HYDROGENATED AMORPHOUS SILICON ON THE FORMATION RATE KINETICS AND CRYSTALLOGRAPHY OF PALLADIUM SILICIDE FILMS 617

THE ROLE OF CHEMICAL INTERACTIONS IN THE STABILITY OF ARTIFICIAL METALLIC SUPERLATTICES 623
M. Sluiter and P.E.A. Turchi

THE CONTROL OF INTERFACIAL REACTIONS VIA LENGTH SCALES OF ULTRATHIN-FILM MODULATED COMPOSITES 629
Loreli Fister, Thomas Novet, Christopher A. Grant, John McConnell, and David C. Johnson

EVOLUTION OF STRUCTURE WITH Fe LAYER THICKNESS IN LOW DIMENSIONAL Fe/Tb MULTILAYERED STRUCTURES 635
V.G. Harris, K.D. Aylesworth, W.T. Elam, N.C. Koon, R. Coehoorn, and W. Hoving

CHARACTERIZATION OF Pd/V MULTILAYER STRUCTURES BY HIGH-ANGLE ANNULAR DARK-FIELD MICROSCOPY AND HIGH RESOLUTION TEM 641
J. Liu, Y. Cheng, G.D. Lewen, and M.B. Stearns

CHARACTERIZATION OF INCONEL/CARBON MULTILAYER STRUCTURES 647
J. Liu, Y. Cheng, M.W. Lund, Q. Wang, and A. Higgs
CHARACTERIZATION OF INTERFACES IN SiGe SUPERLATTICES
BY COMBINED GRAZING INCIDENCE X-RAY FLUORESCENCE AND
REFLECTIVITY 653
Adrian R. Powell, Jaroslav Bradler, Charles R. Thomas,
Richard A. Kubiak, D. Keith Bowen, Matthew Wormington, and
John M. Hudson

INTERFACE REACTIONS IN BILAYERS OF ALUMINUM AND
NICKEL-CHROMIUM ALLOY 659
S.M. Heald, Zhengquan Tan, and J.K.D. Jayanetti

USING ULTRATHIN-FILM, MODULATED COMPOSITES TO CONTROL
THE REACTION MECHANISM OF TERNARY COMPOUND FORMATION
Loreli Fister and David C. Johnson 665

STRUCTURAL PROPERTIES OF Co/Re SUPERLATTICES 671

DETERMINATION OF INTERMETALLIC FORMATION MECHANISM
USING DIFFERENTIAL, SCANNING CALORIMETRY OF MULTI-
LAYERED THIN FILMS 677
T.E. Schlesinger, S.M. Prokes, and R.C. Cammarata

STRUCTURAL STUDIES OF (ZnSe/FeSe) SUPERLATTICES BY
TRANSMISSION ELECTRON MICROSCOPY 683
K. Park, L. Salamanca-Riba, and B.T. Jonker

HIGH RESOLUTION ELECTRON MICROSCOPY OBSERVATIONS ABOUT
THE INTERFACE STRUCTURE IN A Ti/TIN MULTILAYER MATERIAL
X.G. Ning, L.P. Guo, R.F. Huang, J. Gong, B.H. Yu, L.S. Wen,
and H.Q. Ye 689

ELECTRICAL RESISTIVITY AND CRYSTAL STRUCTURE OF NICKEL-
BASED MULTILAYER THIN FILMS 695
M. Tan, E. Haftek, A. Waknis, and J.A. Barnard

MICROSTRUCTURAL EVOLUTION OF Ti/Ni AND Ni/Ti BILAYER
THIN FILMS 701
E. Haftek, M. Tan, A. Waknis, and J.A. Barnard

SOI INTERFACE STRUCTURES IN SELECTIVE EPITAXIAL GROWTH
Zara S. Weng, R. Gronsky, J.C. Lou, and W.G. Oldham 707

LOW-TEMPERATURE DEVICE-QUALITY SiOx/Si (100) INTERFACES
PREPARED BY A COMBINED REMOTE PLASMA OXIDATION-
DEPOSITION PROCESS 713
T. Yasuda, Y. Ma, and G. Lucovsky

PART VIII: INTERFACES IN NANOCRYSTALLINE MATERIALS
FORMATION AND STABILITY OF NANOCRYSTALLINE Nb-Cu ALLOYS 721
Yoshio R. Abe, J.C. Holzer, and W.L. Johnson

GRAIN GROWTH BEHAVIOR OF NANOCRYSTALLINE NICKEL

PREPARATION AND SINTERING STUDIES OF NANOMETER-SIZED
POLYCRYSTALLINE ZrO2
R. Würschum, G. Soyez, and H.-E. Schaefer 733
ALLOY EFFECTS AND EXTENDED SOLUBILITIES IN BINARY MIXTURES OF NANOMETER-SIZED Fe-Cu CRYSTALS
J. Eckert, R. Birringer, J.C. Holzer, C.E. Krill III, and W.L. Johnson

SYNTHESIS AND CHARACTERIZATION OF BALL-MILLED NANOCRYSTALLINE FCC METALS
J. Eckert, J.C. Holzer, C.E. Krill III, and W.L. Johnson

A COMPARISON OF THE CORROSION BEHAVIOR OF NANOCRYSTALLINE AND NORMAL CRYSTALLINE NICKEL

X-RAY STUDY OF INTERFACIAL INTERACTIONS IN HIGHLY MILLED Sn-Ge POWDERS
J.K.D.S. Jayanetti, S.M. Heald, and Z. Tan

PART IX: METAL/CERAMIC INTERFACES

• STRUCTURAL RELAXATIONS AT METAL/METAL OXIDE INTERFACES
  W. Mader

EQUILIBRIUM AND NON-EQUILIBRIUM METAL-CERAMIC INTERFACES
  Y. Gao and K.L. Merkle

METAL-OXIDE INTERFACIAL STRUCTURES PRODUCED BY INTERNAL OXIDATION
  P. Lu, I.-C. Tung, and F. Cosandey

ROLE OF SURFACE DEFECTS IN METAL-CERAMIC BONDING
  S.M. Mukhopadhyay and C.S. Chen

THE ROLE OF ION SPECIES ON THE ADHESION ENHANCEMENT OF ION BEAM MIXED Fe/AlOx SYSTEMS
  J.E. Pawel, C.J. McHargue, L.J. Romana, L.L. Horton, and J.J. Wert

INTERFACE ELECTRONIC AND MAGNETIC STRUCTURES OF LAYERED Fe IN CONTACT WITH MgO
  Young Kean Kim, Michael E. McHenry, Manuel P. Oliveria, and Mark E. Eberhart

PART X: INTERFACES IN CERAMICS AND COMPOSITES

• INTERFACE STRUCTURE OF IRON OXIDE THIN FILMS GROWN ON SAPPHIRE AND SINGLE-CRYSTAL MgO
  Ian M. Anderson, Lisa M. Tietz, and C. Barry Carter

EXPERIMENTAL DETERMINATION OF RELAXATION OF INTERPHASE INTERFACES IN OXIDE EUTECTICS
  Vinayak P. Dravid, V. Ravikumar, G. Dhalenne, and A. Revcolevschi

ELECTRONIC AND STRUCTURAL PROPERTIES OF INTERFACES CREATED BY POTASSIUM DEPOSITION ON TiO2 (110) SURFACES
  R.J. Lad and L.S. Dake

A STUDY OF DOMAIN BOUNDARY STRUCTURES IN LEAD TITANATE SINGLE CRYSTALS
  C.C. Chou, J. Li, and C.M. Wayman

*Invited Paper
HIGH RESOLUTION ELECTRON MICROSCOPY OF INTERCALATED PHASES IN THE Y-Ba-Cu-O SYSTEM 835
C.P. Burmester, M. Fendorf, L.T. Wille, and R. Gronsky

TEM STUDY OF (015) GROWTH TWINS IN THE Bi-Sr-Ca-Cu-O SUPERCONDUCTORS OBTAINED BY MELT QUENCH TECHNIQUE 841
N. Ohnishi, M. Sankaranarayan, and H. Sato

SIMULATION OF Y-Ba-Cu-O EPITAXIAL GROWTH AND MICRO-STRUCTURE FORMATION 847
C.P. Burmester, L.T. Wille, and R. Gronsky

HREM STUDY ON THE INTERFACE STRUCTURE IN OXYGEN-DEFECTIVE CaMnO₃ SYSTEM 853
H. Shibahara and H. Taguchi

ANALYTICAL ELECTRON MICROSCOPY AND HIGH-RESOLUTION ELECTRON MICROSCOPY STUDIES OF GRAIN-BOUNDARY FILMS IN SILICON NITRIDE-BASED CERAMICS 859
H.-J. Kleebe and M. Rühle

HIGH RESOLUTION ELECTRON MICROSCOPY STUDIES ON THE MICROSTRUCTURE OF β-Si₃N₄/Al INTERFACES IN A β-Si₃N₄/6061Al COMPOSITE 865
X.G. Ning, J. Pan, K.Y. Hu, and H.Q. Ye

STUDY OF INTERFACES IN XD™ Al/TiCₜ METAL MATRIX COMPOSITES 871

INTERFACE AND NEAR-INTERFACE MICROSTRUCTURE OF DISCONTINUOUS REINFORCED METAL MATRIX COMPOSITES 877
James P. Lucas, Nancy Y.C. Yang, and John J. Stephens

AUTHOR INDEX 885

SUBJECT INDEX 889
Preface

This volume contains papers presented at the Symposium on "Structure and Properties of Interfaces in Solids" held at the 1991 Fall Meeting of the Materials Research Society, which took place in Boston, Massachusetts, from December 2-6, 1991. This symposium was intended as a follow-up to the Symposium "Interfacial Structure, Properties, and Design" held in Reno, Nevada, at the MRS Spring Meeting of 1988, and published as MRS Proceedings, Volume 122. The 1991 international meeting was designed to bring together scientists in the interfaces area from all over the world to a single four-day symposium, focused on issues arising from the relationships between the structure, chemistry, and properties of interfaces in metals, ceramics, semiconductors, and composites. The proceedings contain a total of 133 papers, including 14 invited papers, drawn from the 87 platform presentations and the 104 posters. All the manuscripts were peer-reviewed, and our thanks are due to the session chairmen and individual referees, without whose assistance neither the program nor the preparation of the proceedings would have advanced so smoothly.

The proceedings are organized basically in the order of presentation at the meeting, starting with recent developments in structural analysis and characterization of interfaces, followed by current research in the crystallography and role of interfacial defects. There is a large section devoted to grain boundaries alone, which leads into interphase boundaries and phase transformations. Another large section on interfaces and structures in thin films and multilayers reflects the growing awareness of the dependence of thin film properties on these boundaries. The recent interest in composites and high temperature materials is also evidenced by the number of papers addressing these topics. We conclude the proceedings with a section on interfaces in ceramics, in which are included studies of interfaces in high temperature superconductors.

If there is any significant difference in emphasis between the 1988 and 1991 symposia, it is in the greater emphasis on imaging the atomic structure of interfaces in 1991, and the valuable insight that such images can now provide us with in interpreting the properties. Some spectacular examples of in-situ observations in the electron microscope, presented at the meeting and described in this volume, brought this point home even more forcefully.

As usual, it would be impossible to bring together such a distinguished, international group of scientists were it not for the generosity of the symposium sponsors. These are: the Materials Sciences Division of the Lawrence Berkeley Laboratory; General Electric Corporation; Hitachi Scientific Instruments; JEOL, USA, Inc.; and Topcon, Inc. Finally, we would like to thank Deborah Clark, Gretchen Hermes, and Theda Crawford for their assistance in organizing the review process, and in the preparation of the final proceedings.

William A.T. Clark
Ulrich Dahmen
Clyde L. Briant
January 23, 1992
MATERIALS RESEARCH SOCIETY SYMPOSIUM PROCEEDINGS


MATERIALS RESEARCH SOCIETY SYMPOSIUM PROCEEDINGS


