1. Record Nr. UNINA9911006519703321

Titolo	Diffusion processes in advanced technological materials / / edited by Devendra Gupta
Pubbl/distr/stampa	Norwich, N.Y., : William Andrew Pub., c2005
ISBN	1-282-01383-1 9786612013836 0-08-094708-5 0-8155-1689-4
Descrizione fisica	1 online resource (551 p.)
Altri autori (Persone)	GuptaD
Disciplina	530.4/15
Soggetti	Diffusion Diffusion processes - Mathematical models
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Front Cover; Diffusion Processes in Advanced Technological Materials; Copyright Page; Contents; Contributors; Preface; Chapter 1. Diffusion in Bulk Solids and Thin Films: Some Phenomenological Examples; 1.1 Introduction; 1.2 Diffusion in Single Crystals; 1.3 Structurally Inhomogeneous Samples; 1.4 Some Illustrative Experimental Data; 1.5 General Characteristics of Grain Boundary Diffusion; 1.6 Diffusion in Quasicrystalline and Amorphous Alloys; 1.7 Summary; Acknowledgment; References; Chapter 2. Solid State Diffusion and Bulk Properties; 2.1 Introduction; 2.2 Correlations with Bulk Properties 2.3 Equilibrium Thermodynamic Calculation of Diffusion Parameters2.4 Summary; Acknowledgment; Appendix 2A. Taylor Series Expansion of G*; Appendix 2B. Evaluation of Errors in Estimated Parameters; References; Chapter 3. Atomistic Computer Simulation of Diffusion; 3.1 Introduction; 3.2 Atomic Interaction Models; 3.3 Molecular Statics; 3.4 Harmonic Approximation; 3.5 Equilibrium Defect Concentrations; 3.6 Transition Rate Calculations; 3.7 Kinetic Monte Carlo Simulations; 3.8 Molecular Dynamics; 3.9 Conclusions; Acknowledgment; References Chapter 4. Bulk and Grain Boundary Diffusion in Intermetallic Compounds4.1 Introduction; 4.2 Crystal Structures and Point Defects in

Ni, Ti, and Fe Aluminides; 4.3 Diffusion Mechanisms in Intermetallics; 4.4 Experimental Results on Bulk Diffusion in Ordered Aluminides; 4.5 Discussion of Lattice Diffusion in Intermetallics; 4.6 Grain Boundary Diffusion; 4.7 Summary; Acknowledgments; References; Chapter 5. Diffusion Barriers in Semiconductor Devices/Circuits; 5.1 Introduction; 5.2 Diffusion Barriers from the 1960s Through the 1990s
5.3 Brief Review of Diffusion and the Influencing Material Factors5.4 Diffusion Barrier Materials; 5.5 New Concepts in Affecting APDB Behavior at the Interfaces; 5.6 Brief Discussion of an APDB for Low-k ILD Materials; 5.7 Summary; References; Chapter 6. Reactive Phase Formation: Some Theory and Applications; 6.1 Introduction; 6.2 Theoretical Considerations; 6.3 Practical Problems in Electronic Technology; 6.4 Conclusions; Acknowledgments; References; Chapter 7. Metal Diffusion in Polymers and on Polymer Surfaces; 7.1 Introduction
7.2 Diffusion During Nucleation and Growth of Metal Films on Polymers7.3 Metal-Polymer Interaction; 7.4 Diffusion in the Polymer Bulk; 7.5 Summary and Conclusions; Acknowledgments; References; Chapter 8. Measurement of Stresses in Thin Films and Their Relaxation; 8.1 Introduction; 8.2 Measurement Techniques; 8.3 Stress Relaxation; 8.4 Conclusion; References; Chapter 9. Electromigration in Cu Thin Films; 9.1 Introduction; 9.2 Cu Interconnection Integration; 9.3 Test Structure and Experiment; 9.4 Microstructure; 9.5 Theory; 9.6 Resistance and Void Growth; 9.7 Fast Diffusion Paths
9.8 Lifetime Distribution

Sommario/riassunto

This new game book for understanding atoms at play aims to document diffusion processes and various other properties operative in advanced technological materials. Diffusion in functional organic chemicals, polymers, granular materials, complex oxides, metallic glasses, and quasi-crystals among other advanced materials is a highly interactive and synergic phenomenon. A large variety of atomic arrangements are possible. Each arrangement affects the performance of these advanced, polycrystalline multiphase materials used in photonics, MEMS, electronics, and other applications of current and deve