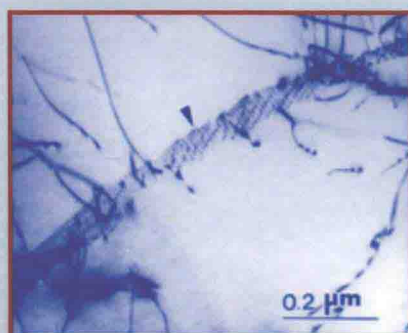
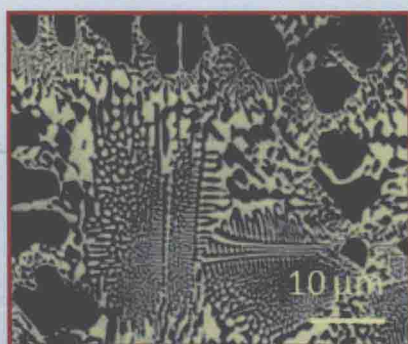
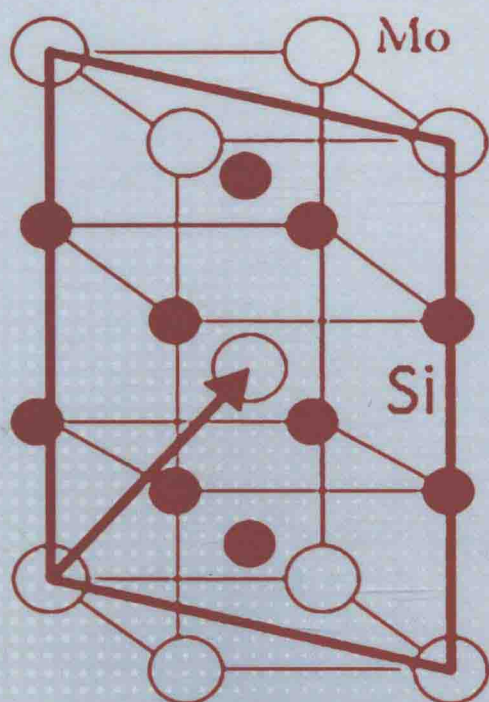


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STRUCTURAL INTERMETALLICS and Intermetallic Matrix Composites



RAHUL MITRA

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Preface

Significant research has been carried out on structural intermetallics for several decades, involving both experimental and theoretical approaches. As a result, the structure–property relations of these materials are reasonably well understood, which has led to a road map for further research to develop high-performance materials for several diverse engineering applications. Work is in progress in many parts of the world to develop selected multicomponent intermetallic alloys based on silicides and aluminides for specific applications, particularly at elevated temperatures and in different types of extreme environments. Of course, there are excellent reviews and book chapters on many of these intermetallics. This monograph has been drafted as a part of the Diamond Jubilee Series of the Indian Institute of Technology Kharagpur. The author has been working on silicides for two decades and has also taught topics related to intermetallic alloys for a postgraduate course on advanced materials. A student learner often finds it difficult to grasp the complexities of the structure of intermetallics and their effect on various physical and mechanical properties. Keeping the requirement of students in mind, the first four chapters of this monograph are devoted to necessary fundamental aspects including thermodynamic principles, phase diagrams and crystal structures, processing methods, deformation and fracture mechanisms of ordered intermetallics, and oxidation behavior with mechanisms for protection against environmental degradation. The fifth chapter focuses on possible applications on the basis of the attractive properties of aluminides and silicides. The last four chapters contain exhaustive reviews of the existing literature on selected structural silicides and aluminides. The contents of this monograph are expected to be helpful to students interested in learning about intermetallics, as well as professionals beginning their research in this area.

The author would like to thank Professor K. K. Ray and Professor S. K. Roy, senior colleagues of his department, for their encouragement to write this monograph. The assistance received from Dr. Monali Ray, a postdoctoral fellow in my research group, in preparing the reference lists for different chapters in a very short time is gratefully acknowledged. The author owes a lot to all his students and collaborators for their contributions in extending my understanding of the subject. The author would also like to thank Dr. Gagandeep Singh and Ms. Marsha Pronin, editors at Taylor and Francis, for their valuable guidance during preparation of the manuscript. This monograph would not have been possible without the constant support and encouragement received from his wife, Mrs. Barnali Mitra, and daughter, Miss Rituparna Mitra, as well as the blessings of his parents, Mr. Paritosh Kumar Mitra and Mrs. Smrity Rani Mitra.

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Abbreviations

APB	Antiphase boundary
APD	Antiphase domain
BDTT	Brittle-to-ductile transition temperature
CRSS	Critical resolved shear stress
CSF	Complex stacking fault
CSL	Coincidence site lattice
CT	Compact tension
CTE	Coefficient of thermal expansion
DS	Directionally solidified
EAM	Embedded atom method
HIP	Hot isostatically pressed
HP	Hot pressed
KW	Kear–Wilsdorf
LPPS	Low-pressure plasma spraying
MA	Mechanical alloying/mechanically alloyed
PM	Powder metallurgy
Poly	Polycrystalline
RT	Room temperature
SC	Single crystal
SEM	Scanning electron microscope
SENB	Single-edge notch bend
SHS	Self-propagating high-temperature synthesis
SISF	Superlattice intrinsic stacking fault
TEM	Transmission electron microscope
UHV	Ultrahigh vacuum
WB TEM	Weak-beam transmission electron microscopy

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