PREFACE

The possibilities for measuring the electronic structure and local lattice defect structures in disordered and ordered alloys have been greatly expanded with recent experimental advances in positron annihilation spectroscopy and in certain hyperfine techniques, such as perturbed angular correlation and Mössbauer spectroscopy. In addition, new developments in synchrotron-radiation and analytical-electron-microscopy experiments appear to hold considerable promise for the future. In parallel with these advances, the opportunities for carrying out realistic electronic structure calculations for disordered atomic ensembles and defects in metallic alloy systems have expanded dramatically in the past few years due, in large part, to the availability of a variety of new theoretical methods and high-speed computers, which make such calculations tractable. Owing to this parallel development of experiment and theory, it is becoming possible for the first time for the theoretical research in this area to benefit both from the availability of experimental touchstones and from the stimulation that these can provide in developing viable predictive understanding of the relationships among electronic structure, lattice defects, and phase stability.

Much of this work has taken place recently in research groups within the United States and Japan. However, little opportunity has been available for in depth interaction among these two subsets of active researchers. It was therefore decided to hold a U.S.-Japan Seminar on Electronic Structure and Lattice Defects in Alloys at the East-West Center, Honolulu, Hawaii during 4-8 May 1987 in order to help rectify this situation and to facilitate further substantial advances in this scientifically exciting and technologically profitable research area. It was uniformly felt that this would be an excellent time for a number of U.S. and Japanese theoretical and experimental practitioners in this field to get together to discuss in detail the rapid progress that has recently been made using a variety of methods, and to explore fruitful avenues for the future. The U.S.-Japan Seminar in Honolulu brought together a group of 28 scientists, both experimentalists and theorists active in the area of electronic structure and lattice defects in alloys. The Seminar provided an opportunity for substantive discussions to be held among the theorists and experimentalists regarding the pros and cons of the various methods now in use to calculate and measure the electronic structure and local defect structures in alloys. In addition, profitable directions for future experimental and theoretical developments were investigated and initiated and several areas of new materials were considered.

These Proceedings were published in order that the content of the presentations and the sense of the discussions could be made available to a wider audience than could reasonably and effectively participate in the Seminar. This collection of 25 papers, written in the months following the Seminar, thus encompasses not only the material presented at the Seminar, but also much of the results of the discussions held there as well. It is hoped that by publishing these Proceedings in an international archival journal, such as Materials Science Forum, which is readily available in institutional libraries, the effective dissemination of information from the Seminar will be considerably enhanced.

Finally, in addition to all of the duly recognized agencies and institutions that have funded the research described in these Proceedings, we would like to particularly thank the U.S. National Science Foundation, Division of International Programs, and the Japan Society for the Promotion of Science for their support of this Seminar under the U.S.-Japan Cooperative Science Program. We also thank the U.S. Office of Naval Research for additional support stemming from an earlier related workshop held at Argonne National Laboratory in June 1986. Also, we acknowledge with gratitude the assistance of James P. McMahon and his staff at the East-West Center, who helped to make our Seminar a pleasant, comfortable, and productive sojourn in the mid-Pacific.

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