Thin Film Structures and Phase Stability

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Thin Film Structures and Phase Stability

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*Invited Paper

Preface

Symposium J, Thin Film Structures and Phase Stability, focused on the ability which thin film deposition and reaction techniques give to engineer materials on the atomic scale. The kinetic and thermodynamic phenomenon in these processes can be used to produce materials with unusual, often metastable, chemical and structural environments. Artificially produced multilayer structures often have unusual conditions of strain, chemical proximity, structure or disorder. The symposium focused on thin film structures, with emphasis on situations where thin film processing allows formation of metastable phases, highly strained materials, and novel solid state reaction phenomenon.

This was a two day symposium, with invited and contributed papers as well as an evening poster session. The first day concentrated on solid state reactions with invited talks by Lindsay Greer from the University of Cambridge, King Tu from IBM Yorktown Heights, and Carl Thompson from MIT. Professor Greer observed that the diffusion of Zr is 10^6 times slower than that of Ni in amorphous NiZr, confirming that Ni is the mobile species in solid state amorphization. King Tu explained the formation of metastable phases in thin film diffusion couples by the concept of 'maximum rate of free energy change.' Carl Thompson discussed the formation of amorphous phases in metal silicon systems, and discussed a two stage nucleation and growth process. The contributed papers also generated discussion on topics such as phase segregation, amorphous silicide formation, room temperature oxidation of silicon, and nucleation during ion beam irradiation. There was a lively poster session on Monday evening with papers on a wide variety of topics covering the general area of thin film science.

The second day had sessions Epitaxy and Multilayer Structure I and II, with the morning focussing on epitaxial and heteroepitaxial growth of thin films. Robin Farrow of IBM Almaden led off with an invited talk where he reported on some remarkable success he and his co-workers have had in growing single crystal epitaxial thin films and superlattices of silver, iron, cobalt and platinum on GaAs. This was followed by several talks on epitaxial growth and characterization. The afternoon focused on interfaces and structure of multilayered materials. A session on possible stress origins of the supermodulus effect was highlighted by lively interaction from the audience. Most of the papers presented at the symposium are presented in this book.

Bruce M. Clemens
William L. Johnson

November 1990

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