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Defect and Impurity Engineered Semiconductors II

Editors: S. Ashok, J. Chevallier, K. Sumino, B. L. Sopori and W. Götz

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Defect and Impurity Engineered Semiconductors II

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PREFACE

This volume results from a symposium held at the 1998 MRS Spring Meeting held April 12-17, in San Francisco. The symposium bearing the same title as this volume, followed a highly successful earlier symposium held at the 1995 MRS Spring Meeting and an earlier precursor, "Defect Engineering in Semiconductor Growth, Processing and Device Technology," held at the 1992 MRS Spring Meeting. The intent of this gathering was to explore deliberate introduction and manipulation of defects and impurities in order to engineer desired properties in semiconductor materials and devices. Reflecting the maturity of the theme, the response from the academic and industrial research community has again been very positive, with over 150 abstracts submitted from around the world.

The organization of this proceedings volume closely follows the topics around which the sessions were built. The papers are grouped by topics covering materials, processing and devices. The papers on grown-in defects in bulk crystals deal with overviews of intrinsic and impurity-related defects, as well as their influence on electrical, optical and mechanical properties. The use of impurities to arrest certain types of defects during growth and defects to control growth are also addressed. In the case of epitaxial films, additional issues concerning stoichiometry and defects caused by plasmas and electron/ion irradiation are included. In view of the current exciting developments in widegap semiconductors like GaN and SiC for blue light-emitting devices and high-temperature electronics, a special session was devoted to the dopant and defect issues relevant to these materials.

Defect reaction problems pertaining to impurity gettering, precipitation and hydrogen passivation are indeed specific examples of defect engineering that improve the electronic quality of the material. A good part of the symposium was devoted to these issues. A number of invited and contributed papers also deal with characterization techniques needed to study and to identify these defects in materials and device structures.

The scope of defect and impurity engineering is far-ranging, as exemplified by interface control and passivation, application of ion implantation, plasma treatment and rapid thermal processing for creating/activating/suppressing trap levels, and device applications. A good complement of papers on these subjects is included in the volume.

The symposium ran for the entire five days of the MRS Meeting, with eight oral sessions and an evening poster session. In addition, the symposium sponsored a comprehensive tutorial on "Defects/Impurities and Gettering in Silicon Science and Technology," given by George Rozgonyi of North Carolina State University, Raleigh, NC. In all, there were 17 invited talks, 56 contributed oral presentations and 47 posters.

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All of the papers were peer-reviewed at the conference and the majority of them were revised. We are most grateful to the referees who often had to forego their evenings in San Francisco to get the paper reviews done on time. The quality of the conference proceedings critically depends on this voluntary endeavor as well as the care exercised by the authors.

Within the limitations of what is possible with an on-site review and tight publication deadline, every effort was made to reduce errors, but the reader is urged to bear with the inevitable shortcomings in the spirit of the symposium title!

Most of the papers presented at the symposium are included in this volume.

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