PREFACE

Group III-Nitrides semiconductor materials, including GaN, InN, AlN, InGaN, AlGaN and AlInGaN, i.e. (Al, In, Ga)N, are excellent semiconductors, covering the spectral range from UV to visible and to infrared, with unique properties very suitable for modern electronic and optoelectronic applications. Remarkable breakthroughs have been achieved in recent years for research and development (R&D) in these materials and devices, such as high-power and high-brightness blue-green-white light emitting diodes (LEDs) and blue laser diodes (LDs) as well as other optoelectronics and electronics devices and applications. III-Nitrides-based industry is forming up and new economic developments from these materials are promising. It is expected that III-Nitrides-based LEDs might replace the traditional light bulbs to realize a revolution in lightings and change the entire human life in this century, similar to Edison's invention of the electric light bulb more than one hundred years ago.

The developments on these materials and devices are moving so quickly. Many data or knowledge, even published quite recently, have been modified and need to upgrade. This new book will cover the rapidly new developments and achievements in the field, in particular those made after entering the 21st century. It is not pure science, but engineering and materials.

The book is organized for a wide range of audiences and covers each of the basic and critical aspects of III-Nitrides science and technology. Each chapter, written by experts in the field, reviews the important topics and achievements in recent years, discusses progresses made by different groups, and suggests further works needed. This book provides useful information to material growth, characterization, application and development on the III-Nitrides semiconductor materials.

This book consists of 12 well-written review chapters and the topics of the book include: 1) Hydride vapor phase epitaxy of group III nitride materials, 2) Planar MOVPE technology for epitaxy of III-nitride

materials, 3) Close-Coupled Showerhead MOCVD technology for the epitaxy of GaN and related materials, 4) Molecular beam epitaxy for III-N materials, 5) Growth and properties of nonpolar GaN films and heterostructures, 6) Indium-nitride growth by high-pressure CVD: real-time and ex-situ characterization, 7) A new look on InN, 8) Growth and optical/electrical properties of $Al_xGa_{1-x}N$ alloys in the full composition range, 9) Optical investigation of InGaN/GaN quantum well structures grown by MOCVD, 10) Clustering nanostructures and optical characteristics in InGaN/GaN quantum-well structures with silicon doping, 11) III-nitrides micro- and nano-structures, and 12) New developments in dilute nitride semiconductor research.

As seen, the current book presents the key properties of III-Nitrides materials, describes key technologies and demonstrates the remaining challenging issues in material growth and device fabrication for future R&D in the 21st century. This book is useful to material growers and evaluators, device design and processing engineers as well as potential users of III-Nitrides technologies, including new comers, postgraduate students, engineers and scientists in the III-Nitrides field.

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