

Preface

Although nanostructured silicon carbide is rapidly evolving, the field is still in the infancy stage and full potential of the materials is far from being realized. This book provides the state of the art of the various nanostructures of wide bandgap silicon carbide including nanoparticles, nanowires, nanotubes, porous structures, nanostructured films, and other complex nanostructures. Topics covered in this book include the fabrication methods, polytypes, bulk and surface structures, electronic structures, properties especially electrical and optical ones, as well as potential applications. The target readership is graduate students and researchers in universities, research institutes, and companies working on SiC and related materials in the fields of materials science, physics, chemistry, electronic engineering, biomedical engineering, and biomedicine.

It is impossible to cover all the aspects of the materials in a single book and so our intention is to provide an up-to-date review of the relevant results and present a holistic view of this burgeoning field. As a self-contained monograph, Chap. 1 is the brief introduction and Chap. 2 describes the general properties of bulk silicon carbide in order to provide the necessary background to understand the properties of silicon carbide nanostructures. It covers the bulk structures, surface structures, defects, electronic structures, luminescence properties, infrared and Raman characteristics, as well as common polytypes and pertinent transformation. However, the application of silicon carbide to electronic devices is omitted because there are already several excellent books on this subject. Chapters 3 and 4 address the porous silicon carbide nanostructures and individual silicon carbide nanoparticles with emphasis on the complex relationship between the structure and luminescence properties and mechanisms. Chapters 5 and 6 describe silicon carbide nanowires and nanotubes concentrating on the synthesis, stacking fault defects, unique properties, and applications and Chap. 7 deals with common nanostructured silicon carbide films with focus on ones containing silicon carbide nanocrystals. In Chap. 8, the biological applications of silicon carbide nanostructures are discussed. Topics covered include biomorphic silicon carbide ceramics, biological imaging, and cytotoxicity evaluation.

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