

Preface

Advances in nanotechnology over the past decade have made scanning electron microscopy (SEM) an indispensable and powerful tool for analyzing and constructing new nanomaterials. Development of nanomaterials requires advanced techniques and skills to attain higher quality images, understand nanostructures, and improve synthesis strategies. A number of advancements in SEM such as field emission guns, electron back scatter detection (EBSD), and X-ray element mapping have improved nanomaterials analysis. In addition to materials characterization, SEM can be integrated with the latest technology to perform *in-situ* nanomaterial engineering and fabrication. Some examples of this integrated technology include nanomanipulation, electron beam nanolithography, and focused ion beam (FIB) techniques. Although these techniques are still being developed, they are widely applied in every aspect of nanomaterial research. *Scanning Microscopy for Nanotechnology* introduces some of the new advancements in SEM techniques and demonstrate their possible applications.

The first section covers basic theory, newly developed EBSD techniques, advanced X-ray analysis, low voltage imaging, environmental microscopy for biomaterials observation, e-beam nanolithography patterning, FIB nanostructure fabrication, and scanning transmission electron microscopy (STEM). These chapters contain practical examples of how these techniques are used to characterize and fabricate nanomaterials and nanostructures.

The second section discusses the applications of these SEM-based techniques, including nanowires and carbon nanotubes, photonic crystals and devices, nanoparticles and colloidal self-assembly, nano-building blocks fabricated through templates, one-dimensional wurtzite semiconducting nanostructures, bio-inspired nanomaterials, *in-situ* nanomanipulation, and cry-SEM stage in nanostructure research. These applications are widely used in fabricating and engineering new nanomaterials and nanostructures.

A unique feature of this book is that it is written by experts from leading research groups who specialize in the development of nanomaterials using these SEM-based techniques. Additional contributions are made by application specialists from several popular instrument vendors concerning their techniques to

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characterize, engineer, and manipulate nanomaterials *in-situ* SEM. *Scanning Microscopy for Nanotechnology* should be a useful and practical guide for nanomaterial researchers as well as a valuable reference book for students and SEM specialists.

WEILIE ZHOU
ZHONG LIN WANG



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