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# Nanofabrication Using Focused Ion and Electron Beams: Principles and Applications (Oxford Series in Nanomanufacturing)

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**Nanofabrication Using Focused Ion and Electron Beams: Principles and Applications (Oxford Series in Nanomanufacturing)**
*Nanofabrication Using Focused Ion and Electron Beams* presents fundamentals of the interaction of focused ion and electron beams (FIB/FEB) with surfaces, as well as numerous applications of these techniques for nanofabrication involving different materials and devices.

The book begins by describing the historical evolution of FIB and FEB systems, applied first for micro- and more recently for nanofabrication and prototyping, practical solutions available in the market for different applications, and current trends in development of tools and their integration in a fast growing field of nanofabrication and nanocharacterization. Limitations of the FIB/FEB techniques, especially important when nanoscale resolution is considered, as well as possible ways to overcome the experimental difficulties in creating new nanodevices and improving resolution of processing, are outlined.

Chapters include tutorials describing fundamental aspects of the interaction of beams (FIB/FEB) with surfaces, nanostructures and adsorbed molecules; electron and ion beam chemistries; basic theory, design and configuration of equipment; simulations of processes; basic solutions for nanoprototyping. Emerging technologies as processing by cluster beams are also discussed.

In addition, the book considers numerous applications of these techniques (milling, etching, deposition) for nanolithography, nanofabrication and characterization, involving different nanostructured materials and devices. Its main focus is on practical details of using focused ion and electron beams with gas assistance (deposition and etching) and without gas assistance (milling/cutting) for fabrication of devices from the fields of nanoelectronics, nanophotonics, nanomagnetics, functionalized scanning probe tips, nanosensors and other types of NEMS (nanoelectromechanical systems). Special attention is given to strategies designed to overcome limitations of the techniques (e.g., due to damaging produced by energetic ions interacting with matter), particularly those involving multi-step processes and multi-layer materials.

Through its thorough demonstration of fundamental concepts and its presentation of a wide range of technologies developed for specific applications, this volume is ideal for researches from many different disciplines, as well as engineers and professors in nanotechnology and nanoscience.

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