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Nota di contenuto	Introduction to Nanorobotic Manipulation and Assembly; Contents; Preface; 1 Introduction to Nanomanufacturing; 1.1 Nanomanufacturing; 1.1.1 Top-Down Nanomanufacturing; 1.1.2 Bottom-Up Nanomanufacturing; 1.2 Nanoassembly and Nanomanipulation; 1.3 Major Challenges in Nanomanufacturing; 1.4 Overview; References; 2 Microscopic Force Analysis in Nanomanipulation; 2.1 Scaling Effects: Quantum or Classical?; 2.2 Interaction Forces in Nanomanipulation; 2.2.1 Attractive Normal Forces; 2.2.2 Repulsive Normal Forces; 2.2.3 Lateral Forces; 2.3 Distinctions Between Macroscopic Forces and Nanoscale Forces. 3.4.3 Nanomanipulation with PZT Enabled Actuation3.4.4 Summary; 3.5 Conclusion; References; 4 Nanomanipulation by Dielectrophoresis; 4.1 Overview; 4.2 Dielectrophoretic Based Manipulation; 4.2.1 Principle of Dielectrophoretic Force; 4.3 Theory of Dielectrophoretic Manipulation; 4.3.1 Modeling of Electroration for Micro- and Nanomanipulation; 4.3.2 Dynamic Modeling of Rotational Motion of Carbon Nanotubes for Intelligent Manufacturing of CNT Based Devices; 4.3.3 Dynamic Effect of Fluid Medium Nanoparticles by Dielectrophoresis; 4.4 Dielectrophoretic Manipulation of Carbon Nanotubes. 4.4.1 Introduction4.4.2 Dielectrophoretic Force: Simulation Results; 4.4.3 Electroration (Torque): Simulation Results; 4.4.4 Rotational

Motion of Carbon Nanotubes: Simulation Results; 4.5 Manipulation of Carbon Nanotubes using Microfluidics; 4.6 Towards Very-Large-Scale Integrated Micro and Nanofluidics; 4.6.1 Generation of Microdroplet; 4.6.2 Biological Applications of Microdispensers; 4.7 Summary; References; 5 Overview of Nanomanipulation by Scanning Probe; 5.1 Introduction to Atomic Force Microscopy; 5.2 Interactive Force Between Tip and Sample; 5.3 AFM Operating Modes. 5.3.1 Force Modulation Mode 5.3.2 Contact Mode; 5.3.3 Tapping Mode; 5.4 Historical Review of SPM Based Nanorobotics; 5.5 Modern Schemes of SPM Based Nanorobotics; 5.5.1 Interactive Manipulation-Scan-Manipulation; 5.5.2 Manipulation with Haptic Feedback; 5.5.3 Parallel Imaging and Manipulation; 5.5.4 Manipulation with Real-Time Visual Feedback; 5.6 Problems and Solutions; References; 6 Reducing Atomic-Scale Stick-Slip Motion by Feedback Control in Nanomanipulation; 6.1 Modeling of the Atomic-Scale Nanomanipulation System; 6.2 Open-Loop Control; 6.3 Real-Time Feedback Control.

Sommario/riassunto

Nanotechnology will allow us to build devices smaller than previously thought possible and will bring fundamental changes to disciplines within engineering, chemistry, medicine, biology, and physics. Understanding the principles of nano manipulation and assembly is tremendously important for those aiming to develop nanoscale systems. This forward-looking resource offers you cutting-edge coverage of the fundamentals and latest applications in this burgeoning field from an engineering perspective. The book shows you how nanomanipulation allows for the detection and manipulation of tiny entities.
