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| 1. Record Nr. | UNINA9910814242903321 |
| Autore | Haugstad Greg <1963-> |
| Titolo | Atomic force microscopy : understanding basic modes and advanced applications / / Greg Haugstad |
| Pubbl/distr/stampa | Hoboken, N.J., : John Wiley & Sons, c2012 |
| ISBN | 9781283646024 1283646021 9781118360699 1118360699 9781118360682 1118360680 9781118360668 1118360664 |
| Edizione | [1st ed.] |
| Descrizione fisica | 1 online resource (488 p.) |
| Disciplina | 620/.5 |
| Soggetti | Atomic force microscopy Scanning probe microscopy |
| Lingua di pubblicazione | Inglese |
| Formato | Materiale a stampa |
| Livello bibliografico | Monografia |
| Note generali | Description based upon print version of record |
| Nota di bibliografia | Includes bibliographical references and index |
| Nota di contenuto | Atomic Force Microscopy: Understanding Basic Modes and Advanced Applications; Contents; Preface; Acknowledgments; 1. Overview of AFM; 1.1. The Essence of the Technique; 1.2. Property Sensitive Imaging: Vertical Touching and Sliding Friction; 1.3. Modifying a Surface with a Tip; 1.4. Dynamic (or "AC" or "Tapping") Modes: Delicate Imaging with Property Sensitivity; 1.5. Force Curves Plus Mapping in Liquid; 1.6. Rate, Temperature, and Humidity-Dependent Characterization; 1.7. Long-Range Force Imaging Modes; 1.8. Pedagogy of Chapters; References; 2. Distance-Dependent Interactions 2.1. General Analogies and Types of Forces 2.2. Van der Waals and Electrostatic Forces in a Tip-Sample System; 2.2.1. Dipole-Dipole Forces; 2.2.2. Electrostatic Forces; 2.3. Contact Forces and Mechanical Compliance; 2.4. Dynamic Probing of Distance-Dependent Forces; 2.4.1. Importance of Force Gradient; 2.4.2. Damped, Driven Oscillator: Concepts and Mathematics; 2.4.3. Effect of Tip-Sample Interaction on |

Oscillator; 2.4.4. Energy Dissipation in Tip-Sample Interaction; 2.5. Other Distance-Dependent Attraction and Repulsion: Electrostatic and Molecular Forces in Air and Liquids 2.5.1. Electrostatic Forces in Liquids: Superimposed on Van der Waals Forces 2.5.2. Molecular-Structure Forces in Liquids; 2.5.3. Macromolecular Steric Forces in Liquids; 2.5.4. Derjaguin Approximation: Colloid Probe AFM; 2.5.5. Macromolecular Extension Forces (Air and Liquid Media); 2.6. Rate/Time Effects; 2.6.1. Viscoelasticity; 2.6.2. Stress-Modified Thermal Activation; 2.6.3. Relevance to Other Topics of Chapter 2; References; 3. Z-Dependent Force Measurements with AFM; 3.1. Revisit Ideal Concept; 3.2. Force-Z Measurement Components: Tip/Cantilever/Laser/Photodetector/Z Scanner 3.2.1. Basic Concepts and Interrelationships 3.2.2. Tip-Sample Distance; 3.2.3. Finer Quantitative Issues in Force-Distance Measurements; 3.3. Physical Hysteresis; 3.4. Optical Artifacts; 3.5. Z Scanner/Sensor Hardware: Nonidealities; 3.6. Additional Force-Curve Analysis Examples; 3.6.1. Glassy Polymer, Rigid Cantilever; 3.6.2. Gels, Soft Cantilever; 3.6.3. Molecular-Chain Bridging Adhesion; 3.6.4. Bias-Dependent Electrostatic Forces in Air; 3.6.5. Screened Electrostatic Forces in Aqueous Medium; 3.7. Cantilever Spring Constant Calibration; References; 4. Topographic Imaging 4.1. Idealized Concepts 4.2. The Real World; 4.2.1. The Basics: Block Descriptions of AFM Hardware; 4.2.2. The Nature of the Collected Data; 4.2.3. Choosing Setpoint: Effects on Tip-Sample Interaction and Thereby on Images; 4.2.4. Finite Response of Feedback Control System; 4.2.5. Realities of Piezoscaners: Use of Closed-Loop Scanning; 4.2.6. Shape of Tip and Surface; 4.2.7. Other Realities and Operational Difficulties-Variable Background, Drift, Experimental Geometry; References; 5. Probing Material Properties I: Phase Imaging 5.1. Phase Measurement as a Diagnostic of Interaction Regime and Bistability

Sommario/riassunto

This book enlightens readers on the basic surface properties and distance-dependent intersurface forces one must understand to obtain even simple data from an atomic force microscope (AFM). The material becomes progressively more complex throughout the book, explaining details of calibration, physical origin of artifacts, and signal/noise limitations. Coverage spans imaging, materials property characterization, in-liquid interfacial analysis, tribology, and electromagnetic interactions. "Supplementary material for this book can be found by entering ISBN 9780470638828 on booksuppo
