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Nota di contenuto	Scanning Probe Microscopy in Industrial Applications: Nanomechanical Characterization; Copyright; Contents; Contributors List; Preface; Acknowledgments; Chapter 1 Overview of Atomic Force Microscopy; 1.1 A Word on Nomenclature; 1.2 Atomic Force Microscopy-The Appeal to Industrial R&D; 1.3 Mechanical Properties; 1.4 Overview of AFM Operation; 1.4.1 AFM Hardware; 1.4.2 Cantilevers and Probes; 1.4.3 Optical Detection System; 1.4.4 x-y-z Scanner; 1.4.5 AFM Software; 1.4.6 Calibrations; 1.4.7 Cantilever Spring Constant; 1.4.8 Tip Shape Calibration; 1.5 Nanomechanical Methods Surveyed in Book 1.6 Industries RepresentedAcknowledgments; References; Chapter 2 Understanding the Tip-Sample Contact: An Overview of Contact Mechanics from the Macro- to the Nanoscale; 2.1 Hertz Equations for Elastic Contact; 2.1.1 Introduction; 2.1.2 Hertz Equations; 2.1.3 Assumptions of Hertz model; 2.1.4 Worked Examples: Hertz Mechanics of Diamond Tips on Stiff and Compliant Substrates; 2.2 Adhesive Contacts; 2.2.1 introduction to Adhesion; 2.2.2 Basic Physics and Mathematics of Surface Interactions; 2.2.3 Derjaguin-Muller-Toporov and Johnson-Kendall-Roberts Models of Adhesion

2.2.4 More Realistic Picture of Adhesion; 2.2.5 Continuing the Worked Examples: Adding Adhesion to Diamond Tips on Stiff and Compliant Substrates; 2.3 Further Extensions of Continuum Contact Mechanics Models; 2.3.1 Tip Shape Differs from a Paraboloid; 2.3.2 Flattened Tip Shapes; 2.3.3 Axisymmetric Power Law Tip Shapes; 2.3.4 Anisotropic Elasticity, Viscoelastic, and Plastic Effects; 2.4 Thin Films; 2.5 Tangential Forces; 2.5.1 Three Possible Cases for a Tangentially Loaded Contact; 2.5.2 Active Debate over the Behavior of the Shear Stress; 2.5.3 Lateral Stiffness; 2.6 Application of Continuum Mechanics to Nanoscale Contacts; 2.6.1 Unique Considerations of Nanoscale Contacts; 2.6.2 Evidence of Applicability of Continuum Contact Mechanics at the Nanoscale; Acknowledgments; APPENDIX 2A Surface Energy and Work of Adhesion; References; Chapter 3 Understanding Surface Forces Using Static and Dynamic Approach-Retraction Curves; 3.1 Tip-Sample Interaction Forces; 3.1.1 Piecewise Linear Contact; 3.1.2 Piecewise Linear Attractive-Repulsive Contact; 3.1.3 Lennard-Jones Potential; 3.1.4 Derjaguin-Muller-Toporov + van der Waals Model; 3.1.5 Viscoelastic Forces; 3.1.6 Capillary Forces; 3.2 Static F-Z Curves; 3.2.1 Conversion of F-Z Curves into F-d Curves; 3.2.2 Examples from Literature; 3.2.3 Uncertainties and Sources of Error; 3.3 Dynamic Amplitude/Phase-Distance Curves; 3.3.1 Theory; 3.3.2 Interpreting the Virial; 3.3.3 Physics of Amplitude Reduction; 3.3.4 Attractive and Repulsive Regimes of Interaction; 3.3.5 Reconstruction of Forces; 3.4 Brief Guide to VEDA Simulations; 3.4.1 F-Z Curve Tutorial; 3.4.2 Amplitude/Phase-Distance Curves Tutorial; 3.4.3 Advanced Amplitude/Phase-Distance Curves Tutorial; 3.5 Conclusions; Glossary; References; Chapter 4 Phase Imaging

Sommario/riassunto

Describes new state-of-the-science tools and their contribution to industrial R&D. With contributions from leading international experts in the field, this book explains how scanning probe microscopy is used in industry, resulting in improved product formulation, enhanced processes, better quality control and assurance, and new business opportunities. Readers will learn about the use of scanning probe microscopy to support R&D efforts in the semiconductor, chemical, personal care product, biomaterial, pharmaceutical, and food science industries, among others. Scanning Probe
