
Preface

The rapidly increasing activities in nanoscience and nanotechnology supported by sizable national programs has led to a variety of efforts in the development and understanding of scanning probe techniques as well as their applications to industrial and medical environments. Beyond imaging, scanning probe techniques representing the eyes of nanotechnology allows us to investigate surfaces and interfaces close to surfaces at the nanometer scale and below, thus providing information about structure, mechanical, electronic, and magnetic properties. It became apparent during the collection phase of Vol. I in 2003 that many more activities exist which deserve presentation. Therefore, this three volume set was prepared in order to display the wide breadth of this field and also to provide an excellent compendium for recent developments in this area. The response of colleagues and research groups being asked to contribute has been very positive, such that we decided, together with the publisher, to rapidly move on in these areas. It became possible to collect excellent contributions displaying first hand information from leading laboratories worldwide.

The present volumes II–IV cover three main areas: scanning probe microscopy (SPM) techniques (Vol. II); characterization (basic aspects, research, Vol. III); and industrial applications (Vol. IV).

Volume II includes overviews on sensor technology based on SPM probes, high harmonic dynamic force microscopy, scanning ion conduction microscopy, spin polarized STM, dynamic force microscopy and spectroscopy, quantitative nanomechanical measurements in biology, scanning micro deformation microscopy, electrostatic force and force gradient microscopy and nearfield optical microscopy. This volume also includes a contribution on nearfield probe methods such as the scanning focus ion beam technique which is an extremely valuable tool for nanofabrication including scanning probes.

Volume III includes the application of scanning probe methods for the characterization of different materials, mainly in the research stage, such as applications of SPM on living cells at high resolution, macromolecular dynamics, organic supramolecular structures under UHV conditions, STS on organic and inorganic low dimensional systems, and ferroelectric materials, morphological and tribological characterization of rough surfaces, AFM for contact and wear simulation, analysis of fullerene like nanoparticles and applications in the magnetic tape industry.

The more relevant industrial applications are described in Vol. IV, which deals with scanning probe lithography for chemical, biological and engineering applications, nanofabrication with self-assembled monolayers by scanned probe lithography, fabrication of nanometer scale structures by local oxidation, template effects of

molecular assemblies, microfabricated cantilever arrays, nanothermomechanics and applications of heated atomic force microscope cantilevers.

Certainly, the distinction between basic research fields of scanning probe techniques and the applications in industry are not sharp, as becomes apparent in the distribution of the individual articles in the different parts of these volumes. On the other hand, this clearly reflects an extremely active research field which strengthens the cooperation between nanotechnology and nanoscience.

The success of the series is solely based on the efforts and the huge amount of work done by the authors. We gratefully acknowledge their excellent contributions in a timely manner which helps to inform scientists in research and industry about latest achievements in scanning probe methods. We also would like to thank Dr. Marion Hertel, Senior Editor Chemistry, and Mrs. Beate Siek of Springer Verlag for their continuous support, without which this volume could never make it efficiently to market.

January, 2006

Prof. Bharat Bhushan, USA
Prof. Harald Fuchs, Germany