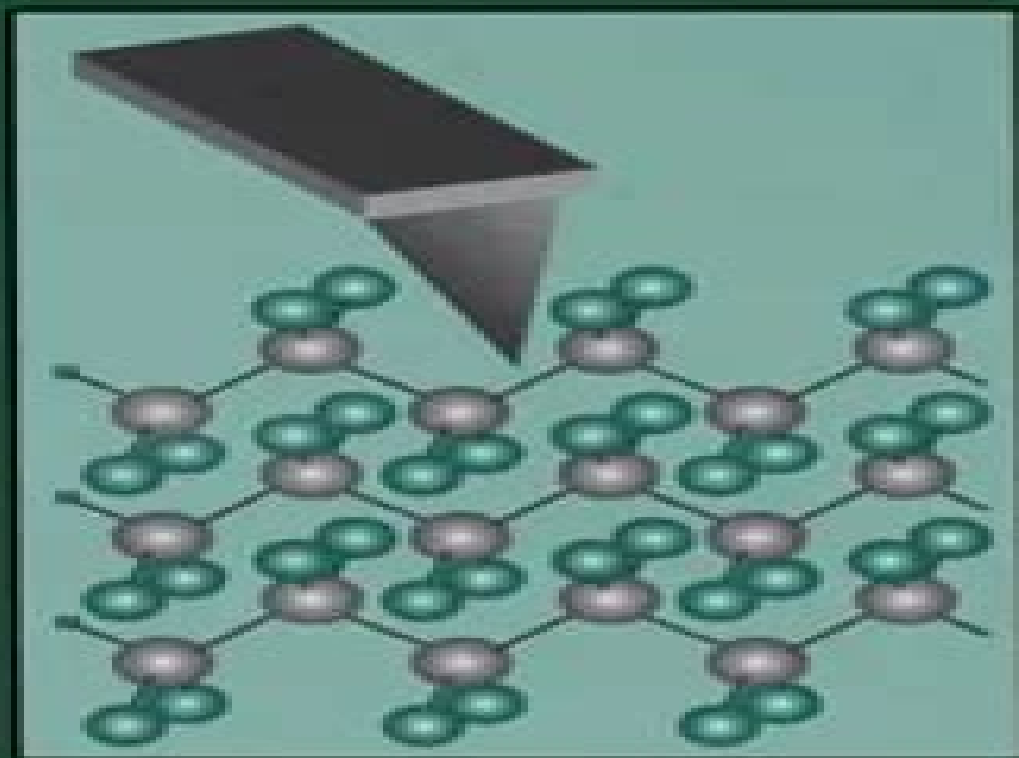


Scanning Probe Microscopy of Polymers



EDITED BY
Buddy D. Ratner and Vladimir V. Tsukruk

Scanning Probe Microscopy Of Polymers

G. Julius Vancso, Holger Schönherr



Scanning Probe Microscopy Of Polymers:

Scanning Probe Microscopy of Polymers, 1998 *Scanning Probe Microscopy of Polymers* Buddy D. Ratner, American Chemical Society. Meeting, 1998 The highlights of this book include an examination of the use of scanning probe microscopy to characterize a variety of polymeric materials from polymer single crystals and molecular films to composites and biopolymers The volume provides a synthesis of critical overviews and important new developments including applications in atomic resolution chemical force microscopy and recognition nanolithography It includes a review of basic principles and operational modes terminology trends and a discussion of key industrial applications such as polymer fibers polymer composites and filled polymers It also includes chapters on biopolymers and living cells and on methods for probing micromechanical properties *Advances in Scanning Probe Microscopy of Polymers* I. Meisel, C. S. Kniep, S. Spiegel, K. Grieve, 2001-08-15 The symposium Recent Advances in Scanning Probe Microscopy of Polymers held during the 220th American Chemical Society National Meeting in Washington DC in August 2000 focused on the latest advances in applications of SPM techniques for the study of polymeric and organic materials The main topics consisted of SPM imaging of polymer morphology and microstructure microtribological properties of polymers micromechanical probing of polymers microthermal imaging studies of ultrathin and molecular organic and polymeric films modeling of tip surface interactions chemical compositional analysis of heterogeneous materials and SPM applications to industrial polymers This volume of Macromolecular Symposia will be a valuable guide in the field of contemporary SPM studies of polymeric materials

Scanning Force Microscopy of Polymers G. Julius Vancso, Holger Schönherr, 2010-08-02 Scope of the Book Synthetic and natural polymers exhibit a complex structural and morphological hierarchy on multiple length scales 1 which determines their performance Thus research aiming at visualizing structure and morphology using a multitude of microscopy techniques has received considerable attention since the early days of polymer science and technology Various well developed techniques such as optical microscopy and different forms of electron microscopy Scanning Electron Microscopy SEM Transmission Electron Microscopy TEM Environmental Scanning Electron Microscopy ESEM allow one to view polymeric structure at different levels of magnification These classical techniques and their applications to polymers are well documented in the literature 2 3 The invention of Scanning Tunneling Microscopy STM inspired the development of Atomic Force Microscopy AFM and other forms of scanning proximity microscopes in the late 1980s 4 5 AFM unlike STM can be used to image nonconducting specimens such as polymers In addition AFM imaging is feasible in liquids which has several advantages Using liquid imaging cells the forces between specimen and AFM probe are drastically reduced thus sample damage is prevented In addition the use of water as imaging medium opened up new applications aiming at imaging characterizing and analyzing biologically important systems **Applications of Scanned Probe Microscopy to Polymers** James Daryl Batteas, Chris A. Michaels, Gilbert C. Walker, 2005 Applications of Scanned Probe Microscopy to Polymers stresses the

analysis of polymer and biopolymer surfaces using the ever expanding methodologies of scanned probe microscopies This book includes studies of optical properties by near field methodologies local mechanical properties of polymer films by AFM the dynamics and mechanics of single molecules probed by AFM and methodologies for enhanced imaging modes A primary focus of this book is the quantitative measurement of surface properties by scanned probe techniques which illustrates how the field has evolved and what new challenges lie ahead Applications of Scanned Probe Microscopy to Polymers will be valuable to students and professionals looking for studies that illustrate what types of polymer material properties may be probed by scanned probe microscopies **Scanning Probe Microscopy of Polymers**, 2004 **Applied Scanning Probe Methods IV** Bharat Bhushan, Harald Fuchs, 2006-04-28 Provides a comprehensive overview of SPM applications The international perspective offered in these three volumes contributes to the evolution of SPM techniques Volumes II III and IV examine the physical and technical foundation for progress in applied near field scanning probe techniques **Scanning Probe Microscopy of Conjugated Polymers** Stephen Francis Bond, 1994 **Scanning Probe Microscopy of Soft Matter** Vladimir V. Tsukruk, Srikanth Singamaneni, 2012-01-09 Well structured and adopting a pedagogical approach this self contained monograph covers the fundamentals of scanning probe microscopy showing how to use the techniques for investigating physical and chemical properties on the nanoscale and how they can be used for a wide range of soft materials It concludes with a section on the latest techniques in nanomanipulation and patterning This first book to focus on the applications is a must have for both newcomers and established researchers using scanning probe microscopy in soft matter research From the contents Atomic Force Microscopy and Other Advanced Imaging Modes Probing of Mechanical Thermal Chemical and Electrical Properties Amorphous Poorly Ordered and Organized Polymeric Materials Langmuir Blodgett and Layer by Layer Structures Multi Component Polymer Systems and Fibers Colloids and Microcapsules Biomaterials and Biological Structures Nanolithography with Intrusive AFM Tip and Dip Pen Nanolithography Microcantilever Based Sensors **Scanning Probe Microscopy in Nanoscience and Nanotechnology 3** Bharat Bhushan, 2012-10-16 This book presents the physical and technical foundation of the state of the art in applied scanning probe techniques It constitutes a timely and comprehensive overview of SPM applications The chapters in this volume relate to scanning probe microscopy techniques characterization of various materials and structures and typical industrial applications including topographic and dynamical surface studies of thin film semiconductors polymers paper ceramics and magnetic and biological materials The chapters are written by leading researchers and application scientists from all over the world and from various industries to provide a broader perspective *Scanning Probe Microscopy in Industrial Applications* Dalia G. Yablon, 2013-10-24 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 Microscopy in Industrial Applications emphasizes nanomechanical characterization using scanning probe microscopy The first half of the book is dedicated to a general overview of nanomechanical characterization methods offering a complete practical tutorial for readers who are new to the topic Several chapters include worked examples of useful calculations such as using Hertz mechanics with and without adhesion to model a contact step by step instructions for simulations to guide cantilever selection for an experiment and data analysis procedures for dynamic contact experiments The second half of the book describes applications of nanomechanical characterization in industry including New formulation development for pharmaceuticals Measurement of critical dimensions and thin dielectric films in the semiconductor industry Effect of humidity and temperature on biomaterials Characterization of polymer blends to guide product formulation in the chemicals sector Unraveling links between food structure and function in the food industry Contributions are based on the authors thorough review of the current literature as well as their own firsthand experience applying scanning probe microscopy to solve industrial R D problems By explaining the fundamentals before advancing to applications Scanning Probe Microscopy in Industrial Applications offers a complete treatise that is accessible to both novices and professionals All readers will discover how to apply scanning probe microscopy to build and enhance their R D efforts

Scanning Probe Microscopy in Nanoscience and Nanotechnology 2 Bharat

Bhushan,2010-12-17 This book presents the physical and technical foundation of the state of the art in applied scanning probe techniques It constitutes a timely and comprehensive overview of SPM applications The chapters in this volume relate to scanning probe microscopy techniques characterization of various materials and structures and typical industrial applications including topographic and dynamical surface studies of thin film semiconductors polymers paper ceramics and magnetic and biological materials The chapters are written by leading researchers and application scientists from all over the world and from various industries to provide a broader perspective

Applied Scanning Probe Methods XI Bharat

Bhushan,Harald Fuchs,2008-10-22 The volumes XI XII and XIII examine the physical and technical foundation for recent progress in applied scanning probe techniques These volumes constitute a timely comprehensive overview of SPM

applications Real industrial applications are included

A Scanning Probe Microscopy Study of Polymers and Organic

Molecules Johan Rasmusson,1994

Scanning Probe Microscopy Studies of the Properties of Conducting Polymers

Kevin D. O'Neil,2012 Electronically conducting polymers ECPs have been growing in interest as important materials for a variety of different applications such as charge storage devices and photovoltaics However in all of these applications the performance of conducting polymers are strongly dependent upon their local properties such as morphology local conductivity and carrier mobility local chemical composition etc All polymer materials feature a distribution of these parameters and therefore they are considered heterogeneous In this work we use atomic force microscopy AFM and its

related techniques such as current sensing AFM CS AFM Kelvin probe force microscopy KFM and phase imaging PI AFM to directly investigate the heterogeneity of ECPs specifically poly 2,2'-bithiophene PBT in order to determine how their performance depends on their local properties and their distribution Chapter 4 will address the correlation between topography local conductivity and local surface potential work function of various conducting polymers such as PBT and poly 2-methoxy 5,2'-ethyl hexyloxy 1,4-phenylene vinylene MEH PPV To explain this correlation a model has been proposed which relates these properties to the molecular weight distribution during electropolymerization of conducting polymers Chapter 5 will investigate further into this model by studying the nucleation and growth of conducting polymers It will utilize phase imaging to determine how the distribution of molecular weight and therefore crystallinity can directly affect the overall properties such as conductivity and surface potential in these materials Chapter 6 will focus on the effect of common electrochemical techniques used to prepare these materials and their influence on the local properties of conducting polymers specifically morphology and crystallinity in both thin and thick conducting polymer films Chapter 7 and chapter 8 will add to the previous chapters by investigating the charge discharge doping undoping efficiencies of these materials as charge storage devices in relation to the local properties of these conducting polymer films in order to effectively prepare these materials to increase efficiency for use in electronic devices

Applied Scanning Probe Methods X Bharat Bhushan, Harald Fuchs, Masahiko Tomitori, 2007-12-20 The volumes VIII IX and X examine the physical and technical foundation for recent progress in applied scanning probe techniques This is the first book to summarize the state of the art of this technique The field is progressing so fast that there is a need for a set of volumes every 12 to 18 months to capture latest developments These volumes constitute a timely comprehensive overview of SPM applications

Polymer Reference Book Thomas Roy Crompton, 2006 The aim of this book is to familiarise the reader with all aspects of the techniques used in the examination of polymers covering chemical physiochemical and purely physical methods of examination The types of techniques available to the polymer chemist and technician are described and their capabilities limitations and applications are discussed The book is intended for all staff who are concerned with instrumentation and methodology in the polymer laboratory including laboratory designers engineers and chemists and also those concerned with the implementation of analytical specifications and process control limits

Scanning Probe Microscopy Nikodem Tomczak, Kuan Eng Johnson Goh, 2010-12-13 Scanning Probe Microscopy SPM is the enabling tool for nano bio technology which has opened new vistas in many interdisciplinary research areas Concomitant with the developments in SPM instrumentation and techniques are new and previously unthought of opportunities in materials nanofabrication and characterisation In particular the developments in addressing and manipulating matter at the level of single atoms or molecules and studies of biological materials e.g. live cells or cell membranes result in new and exciting discoveries The rising importance of SPM demands a concise treatment in the form of a book which is accessible to interdisciplinary practitioners This book highlights recent advances in the field of

SPM with sufficient depth and breadth to provide an intellectually stimulating overview of the current state of the art. The book is based on a set of carefully selected original works from renowned contributors on topics that range from atom technology scanning tunneling spectroscopy of self assembled nanostructures SPM probe fabrication scanning force microscopy applications in biology and materials science down to the single molecule level novel scanning probe techniques and nanolithography. The variety of topics underlines the strong interdisciplinary character of SPM related research and the combined expertise of the contributors gives us a unique opportunity to discuss possible future trends in SPM related research. This makes the book not merely a collection of already published material but an enlightening insight into cutting edge research and global SPM research trends.

Applied Scanning Probe Methods II Bharat Bhushan, Harald Fuchs, 2006-02-21. The Nobel Prize of 1986 on Scanning Tunneling Microscopy signaled a new era in imaging. The scanning probes emerged as a new instrument for imaging with a precision sufficient to delineate single atoms. At first there were two: the Scanning Tunneling Microscope or STM and the Atomic Force Microscope or AFM. The STM relies on electrons tunneling between tip and sample whereas the AFM depends on the force acting on the tip when it was placed near the sample. These were quickly followed by the Magnetic Force Microscope MFM and the Electrostatic Force Microscope EFM. The MFM will image a single magnetic bit with features as small as 10 nm. With the EFM one can monitor the charge of a single electron. Prof Paul Hansma at Santa Barbara opened the door even wider when he was able to image biological objects in aqueous environments. At this point the sluice gates were opened and a multitude of different instruments appeared. There are significant differences between the Scanning Probe Microscopes or SPM and others such as the Scanning Electron Microscope or SEM. The probe microscopes do not require preparation of the sample and they operate in ambient atmosphere whereas the SEM must operate in a vacuum environment and the sample must be cross sectioned to expose the proper surface. However the SEM can record 3D image and movies features that are not available with the scanning probes.

Polymer Microscopy Linda Sawyer, David T. Grubb, Gregory F. Meyers, 2008-12-24. Polymer Microscopy Third Edition is a comprehensive and practical guide to the study of the microstructure of polymers and is the result of the authors many years of academic and industrial experience. To address the needs of students and professionals from a variety of backgrounds introductory chapters deal with the basic concepts of both polymer morphology and processing and microscopy and imaging theory. The core of the book is more applied with many examples of specimen preparation and image interpretation leading to materials characterization. Microscopy is applied to the characterization of a wide range of polymer systems including fibers films engineering resins and plastics composites nanocomposites polymer blends emulsions and liquid crystalline polymers. Light microscopy atomic force microscopy and scanning and transmission electron microscopy techniques are all considered as are emerging techniques such as compositional mapping in which microscopy is combined with spectroscopy. This extensively updated and revised Third Edition closes with a problem solving guide which gives a systematic framework for deciding on suitable

approaches to the characterization of polymer microstructure Key Features Revised and updated this Third Edition remains the gold standard for information on the characterization of polymer microstructure Presents a wide variety of polymer systems and characterization techniques Covers the major advances in microscopy and polymers since the publication of the Second Edition in 1996 Describes new methods for use with the SPM and related to advances in cryo TEM as well as new polymer materials such as nanocomposites Includes both basic and applied topics making this book ideal as a professional reference and as a teaching text

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