

1. Record Nr.	UNINA9910819743903321
Titolo	Scanning probe microscopy for energy research // editors, Dawn A. Bonnell, The University of Pennsylvania, USA, Sergei V. Kalinin, Oak Ridge National Laboratory, USA
Pubbl/distr/stampa	[Hackensack] N.J., : World Scientific, c2013 New Jersey : , : World Scientific, , [2013] 2013
ISBN	1-299-46258-8 981-4434-71-X
Descrizione fisica	1 online resource (xvi, 602 pages, 21 pages of plates) : illustrations (some color)
Collana	World scientific series in nanoscience and nanotechnology, , 2301-301X ; ; v. 7
Disciplina	621.31/2028
Soggetti	Electric batteries - Research Scanning probe microscopy - Industrial applications
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	Preface; CONTENTS; List of Color Plates; Introduction; Chapter 1 Local Probes in the Next Decade of Energy Research: Bridging Macroscopic and Atomic Worlds D. A. Bonnell and S. V. Kalinin; 1. The Energy Challenge; 2. The Need for Local Characterization; 3. Science and Technology of Renewable and Sustainable Options; 3.1. Solar cells and photo voltaic devices; Fuel cells; Batteries; 4. Frontiers of Scanning Probe Microscopy; 4.1. Probing local electrical properties; 4.2. Probing local dielectric properties; 4.3. Probing local electrochemical properties 4.4. Future impact of SPM in energy research Acknowledgments; References; I. Scanning Probes for Energy Harvesting Systems: Photovoltaics and Solar Cells; Chapter 2 Electrical Scanning Probe Microscopy on Solar Cell Materials R. Giridharagopal, G. E. Rayermann and D. S. Ginger; 1. Introduction; 2. Conducting Atomic Force Microscopy (cAFM); 3. Photoconductive Atomic Force Microscopy (pcAFM); 4. AC-Mode AFM; 5. Electrostatic Force Microscopy (EFM); 6. Scanning Kelvin Probe Microscopy (SKPM); 7. Time-Resolved Electrostatic Force Microscopy (trEFM); 8. Conclusions and Future

Outlook

Acknowledgments References; Chapter 3 Organic Solar Cell Materials and Devices Characterized by Conductive and Photoconductive Atomic Force Microscopy X.-D. Dang, M. Guide and T.-Q. Nguyen; 1.

Introduction; 2. Basic Operation of Organic Solar Cells; 3. Fundamental Principles of Conductive and Photoconductive AFM; 3.1. Conductive atomic force microscopy; 3.2. Photoconductive atomic force microscopy; 3.3. pc-AFM devices versus bulk solar cell devices; 4. Applications of c-AFM and pc-AFM for Characterization of Organic Solar Cell Materials and Devices

4.1. Local conductivity variation and charge transport 4.2. Probing internal structure of photoactive layers; 4.3. Assigning phase separation in BHJ organic solar cells; 4.4. Local incident photon conversion efficiency; 4.5. Origin of open-circuit voltage of organic solar cells; 5. Summary and Outlook; Acknowledgments; References;

Chapter 4 Kelvin Probe Force Microscopy for Solar Cell Applications T. Glatzel; 1. Introduction; 2. Experimental Technique and Working Modes; 2.1. The Kelvin Principle; 2.2. Technical realization; 3. Application to Solar Cells

3.1. Cu(In, Ga)(S, Se)₂ based solar cells 3.1.1. Surface properties; 3.1.2. Grain boundaries; 3.1.3. Surface photovoltage analysis; 3.1.4. Interface properties; 3.2. Organic solar cells; 3.2.1. Polymer/fullerene solar cells; 3.2.2. Dye-sensitized solar cells; References; Chapter 5 Reversible Rectification in Sub-Monolayer Molecular P-N Junctions: Towards Nanoscale Photovoltaic Studies J. A. Smerdon, N. C. Giebink and J. R. Guest; 1. Introduction; 2. Transport in a D-A HJ at the Molecular Scale; 3. Ultrahigh Vacuum Scanning Tunneling Microscopy and Spectroscopy 4. Promise and Challenges of Laser-Assisted STM

Sommario/riassunto

Efficiency and life time of solar cells, energy and power density of the batteries, and costs of the fuel cells alike cannot be improved unless the complex electronic, optoelectronic, and ionic mechanisms underpinning operation of these materials and devices are understood on the nanometer level of individual defects. Only by probing these phenomena locally can we hope to link materials structure and functionality, thus opening pathway for predictive modeling and synthesis. While structures of these materials are now accessible on length scales from macroscopic to atomic, their functionality h
