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Nota di contenuto	Introduction (U. Celano, W. Vandervorst) -- Conductive AFM for nanoscale analysis of high-k dielectric metal oxides (C. Rodenbücher, M. Wojtyniak, K. Szot) -- Mapping Conductance and Carrier Distribution in Confined Three-Dimensional Transistor Structures (A. Schulze, P. Eyben, K. Paredis, L. Wouters, U. Celano, W. Vandervorst) -- Scanning Capacitance Microscopy for two-dimensional carrier profiling

of semiconductor devices (J. Mody, J. Nxumalo) -- Scanning probe lithography for nanopatterning and fabrication of high-resolution devices (Y. K. Ryu, A. W. Knoll) -- Characterizing Ferroelectricity with an Atomic Force Microscopy: an all-around technique (S. Martin, B. Gautier, N. Baboux, A. Gruvermann, A. Carretero-Genevrier, M. Gich, A. Gomez) -- Electrical AFM for the analysis of Resistive Switching (S. Brivio, J. Frascaroli, M. H. Lee) -- Magnetic force microscopy for magnetic recording and devices (A. Hirohata, M. Samiepour, M. Corbetta) -- Nanoscale space charge density profiling with KPFM and photoconductive C-AFM/KPFM (C. Villeneuve-Faure, K. Makasheva, L. Boudou, G. Teyssedre) -- Electrical AFM of 2D materials and heterostructures for nanoelectronics (F. Giannazzo, G. Greco, F. Roccaforte, C. Mahata, M. Lanza) -- Diamond probes technology (T. Hantschel, T. Conard, J. Kilpatrick, G. Cross) -- Scanning Microwave Impedance Microscopy (sMIM) in electronic materials and quantum materials (K. Rubin, Y. Yang, O. Amster, D. Scrymgeour, S. Misra).

Sommario/riassunto

The tremendous impact of electronic devices on our lives is the result of continuous improvements of the billions of nanoelectronic components inside integrated circuits (ICs). However, ultra-scaled semiconductor devices require nanometer control of the many parameters essential for their fabrication. Through the years, this created a strong alliance between microscopy techniques and IC manufacturing. This book reviews the latest progress in IC devices, with emphasis on the impact of electrical atomic force microscopy (AFM) techniques for their development. The operation principles of many techniques are introduced, and the associated metrology challenges described. Blending the expertise of industrial specialists and academic researchers, the chapters are dedicated to various AFM methods and their impact on the development of emerging nanoelectronic devices. The goal is to introduce the major electrical AFM methods, following the journey that has seen our lives changed by the advent of ubiquitous nanoelectronics devices, and has extended our capability to sense matter on a scale previously inaccessible.