



CMOS Cantilever Sensor Systems: Atomic Force Microscopy and Gas Sensing Applications (Microtechnology and MEMS)

D. Lange, O. Brand, H. Baltes

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This book is intended for scientists and engineers in the field of micro- and nano electro-mechanical systems (MEMS and NEMS) and introduces the development of cantilever-based sensor systems using CMOS-compatible micromachining from the design concepts and simulations to the prototype. It is also a useful resource for researchers on cantilever sensors and resonant sensors in general. The reader will become familiar with the potential of the combination of two technological approaches: IC fabrication technology, notably CMOS technology, and silicon micromachining and the resulting microstructures such as cantilever beams. It was recognized early that these two technologies should be merged in order to make the microstructures smart and devise integrated microsystems with on-chip driving and signal conditioning circuitry - now known as CMOS MEMS or, with the arrival of nanostructures, CMOS NEMS. One way to achieve the merger is the post-processing micro- or nano- machining of finished CMOS wafers, some of which is described in this book. The book introduces this approach based on work carried out at the Physical Electronics Laboratory of ETH Zurich on arrays of cantilever transducers with on-chip driving and signal conditioning circuitry. These cantilevers are familiar from Scanning Probe Microscopy (SPM) and allow the sensitive detection of physical quantities such as forces and mass changes. The book is divided into three parts. First, general aspects of cantilever resonators are introduced, e. g. their resonant behavior and possible driving and sensing mechanisms.

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