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References; 4 Inductive Sensors for Magnetic Fields; 4.1 Inductive Microsensors for Magnetic Particles; 4.1.1 Integrated inductive sensors; 4.1.2 Planar differential transformer; 4.1.3 Signal-conditioning circuits 4.1.4 Simulation of the planar differential transformer4.1.5 Experimental results; 4.2 Magnetic Immunoassay Systems; Acknowledgements; References; 5 Scaling of Mechanical Sensors; 5.1 Introduction; 5.2 Device Modelling and Fabrication Processes; 5.2.1 Fabrication processes; 5.2.2 Devices modelling; 5.2.3 Accelerometers; 5.2.4 Resonant mass sensors; 5.3 Experimental Device Prototypes; 5.3.1 CMOS devices; 5.3.2 SOI devices; 5.3.3 Finite element modelling; 5.4 Scaling Issues on Microaccelerometers and Mass Sensors; 5.5 Some Experimental Results; 5.6 Vibrating Microgyroscopes
5.6.1 Coupled vibratory gyroscopesAcknowledgements; References; 6 Scaling of Energy Sources; 6.1 Introduction; 6.2 Energy Supply Strategies for Autonomous Microsystems; 6.2.1 Use of microlenses in photothermomechanical actuation; 6.2.2 Technologies, materials and design of photothermomechanical actuators; 6.3 Photothermomechanical and Photothermoelectric Strategies for Highly Efficient Power Supply of Autonomous Microsystems; 6.3.1 Photothermoelectric power generation; 6.4 Efficiency of the Combined Energy Supply Strategy; References
7 Technologies and Architectures for Autonomous MEMS Microrobots7. 1 Design Issues in Microrobots; 7.2 A Microrobot Architecture Based on Photothermal Strategy; 7.3 A Microrobot as a Paradigm for the Analysis of Scaling in Microsystems; References; 8 Moving towards the Nanoscale; 8.1 Semiconductor-Based Nano-Electromechanical Systems; 8.2 Nanofabrication Facilities; 8.3 Overview of Nanosensors; 8.3.1 Use of AFM for materials and nanodevices characterization; 8.3.2 Scanning thermal microscopy (SThM); 8.3.3 Scanning Hall probe microscopy 8.3.4 Mechanical resonant immunospecific biological detector

Sommario/riassunto

This accessible volume delivers a complete design methodology for microelectromechanical systems (MEMS). Focusing on the scaling of an autonomous micro-system, it explains the real-world problems and theoretical concepts of several different aspects inherent to the miniaturization of sensors and actuators. It reports on the analysis of dimensional scaling, the modelling, design and experimental characterization of a wide range of specific devices and applications, including: temperature microsensors based on an integrated complementary metal-oxide-semiconductor (CMOS) t