

SPECIAL ISSUE ON DESIGN, FABRICATION, CHARACTERIZATION, AND APPLICATION OF MEMS

PREFACE



In the last thirty years, we have seen extensive research and development in the field of MEMS, or micro-electromechanical systems, which have had a large impact on our everyday life. Many MEMS devices are used ubiquitously in smart phones, automobiles, cameras, printers, and projectors. The scope of research also covers a wide range of topics including modeling-based design, fabrication processes and materials, characterization of performances, and application-specific devices. This special issue aims to provide typical examples of the latest research on such a wide variety of topics.

The first two papers deal with the mathematical modeling and design of energy harvesters; one is an electrostatic vibrational generator and the other is a thermoelectric device incorporating phononic crystals. The next two papers are on fabrication and its characterization. The first one describes a meticulous way to fabricate an extremely sharp tip. The second one is a review on the complicated behaviors of getter materials used for vacuum packaging, emphasizing the importance of *in situ* characterization in actual packages.

Unlike electronic devices, liquids are utilized in or handled by MEMS devices. Three papers deal with such devices. In the first paper, a micro potentiometer is fabricated by taking advantage of the low friction between a conductive liquid and a moving electrode. In the second paper, an anodic-oxidized layer is utilized to produce a high electric field for manipulating droplets on a chip. The third one presents a method of surface coating and texturing for handling sticky cells using MEMS tweezers. Two more papers deal with improving the sensitivity of sensors: by adding metal layers onto the proof mass of a sub-mG accelerometer; and by using interferometry to detect the small deflection of a membrane caused by molecular binding. The final paper provides a perspective on how to organize international collaborations to promote interdisciplinary research on bio-MEMS applications in the medical field.

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