

SPECIAL ISSUE ON PIEZOELECTRIC THIN FILMS AND PIEZOELECTRIC MEMS

PREFACE

Piezoelectric materials have excellent energy conversion efficiency between the mechanical and electrical domains and have been used in a variety of electromechanical devices for a long time. Recently, the development of piezoelectric thin films has opened the door to the realization of miniaturized electromechanical devices called piezoelectric MEMS (Piezo-MEMS). The development of Piezo-MEMS has involved interdisciplinary and intertwined technologies, including material science, surface and thin-film processes, and measurement and device technologies. Piezo-MEMS has already been commercialized in inkjet printer heads, gyro-sensors, and bulk acoustic wave (BAW) filters, and new applications for optical, acoustic, and micro-power-generation devices are being investigated.

The performance of Piezo-MEMS devices strongly depends on the piezoelectric properties of the materials, i.e., the piezoelectric thin films. These thin-film materials, such as $\text{Pb}(\text{Zr,Ti})\text{O}_3$ (PZT) and AlN , have been extensively deposited by sol-gel or rf-sputtering methods and their piezoelectric properties have been intensively characterized. In addition to these two "traditional" piezoelectric thin films, new material candidates, such as lead-free $(\text{K,Na})\text{NbO}_3$ (KNN) or Sc-doped AlN piezoelectric thin films, have also been rapidly developed. These new thin-film materials are expected to facilitate the design and manufacturing of the next-generation piezoelectric microdevices.

This Special Issue on "Piezoelectric Thin Films and Piezoelectric MEMS" features recent advances in piezoelectric thin films and related technologies aimed at MEMS applications. These technologies include new piezoelectric thin-film materials, innovative thin-film processes, and new Piezo-MEMS applications. This Special Issue brings together the latest and noteworthy research results on Piezo-MEMS, and we believe this issue will be useful in predicting future trends in Piezo-MEMS technologies. Finally, we would like to thank all the authors who contributed to this Special Issue, as well as the staff who helped us put together this collection.

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