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Abstract

Si based Micro/Nanomechanical devices for Nanoscience and Nanoengineering

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Miniaturized micro/nanomechanical devices have variety applications in nanoscale science and technology. Recent developments of micro instrumentations for nanoengineering based on advanced Si micromachining technologies are presented. A miniaturized four-terminal probe can handle nanomaterials and enable us to evaluate their electrical properties on the basis of scanning probe microscopy technology. Integration of electrostatic actuator in scanning probe system provides nanometer positioning, which is applied to enhance optical near-field for nano optics. Thermoelectric probe, in which micro-heaters and micro-thermocouples are integrated, offers an advanced tool for evaluating thermoelectric properties of nano materials. Scaling down of mechanical elements decreases the thermomechanical noise and raise its resolution in various sensors. Mass sensor with silicon resonators has been developed and employed for thermogravimetry of nanomaterials. Microfabricated quartz crystal sensor has high potential ability with self-sensing and self-actuation in nanometric sensing. Diamond multi-probe is fabricated for future high-density data storage device, and reversible electrical modification of a conductive polymer is studied for this multi-probe data storage.