Introduction to the Feature Section on Optical MEMS and Nanophotonics

THE idea of fabricating tiny movable devices on chip was first conceived in the late 1960s, and strong research and development activity in this field started at around 1980. Since then, new materials, fabrication process, actuation mechanisms, and sensing methods have been proposed and demonstrated in a rapid-fire stream. The theoretical modeling of these developments has also advanced at a similar rate. In addition to device-level progress, the art of integration via microelectromechanical systems (MEMS) technology has itself advanced swiftly, yielding a huge array of integrated microsystems with rich and versatile functionality. The devices, which are inherently small, have already had significant impact on sensing, display, telecommunications, biology and medicine, and has contributed substantially to various applications in defense and security. Recently, the emergence of nanotechnology and nanofabrication naturally led to incorporation of nanoscale structures into sensing and actuation systems—NEMS, which opens yet another canvas for innovation in device and system technologies as well as their applications.

Optical MEMS emerged as a self-standing discipline of MEMS, after a great variety of integrated micro-optical components and sub-systems were first demonstrated using MEMS technology. As nanotechnology is combined with MEMS/NEMS technology, the emergence of nanophotonics has injected new research trends and dynamics into this field. This feature section is a follow-up to the 2009 IEEE International Conference on Optical MEMS and Nanophotonics. The 11 accepted papers give us a glimpse on some of the recent development in optical MEMS/NEMS technologies, the emerging field of nanophotonics and its application in optical micro- and nano-systems for sensing and actuations. The papers discuss challenging problems, such as optics for very short wavelengths (X-ray), large actuation, fine resolution tuning, high-speed reconfiguration, and tunable laser sources.

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