

Design and Fabrication of an Electrostatically Actuated Parallel-Plate Mirror by 3D-Printer

Authors : J. Mizuno, S. Takahashi

Abstract : In this paper, design and fabrication of an actuated parallel-plate mirror based on a 3D-printer is described. The mirror and electrode layers are fabricated separately and assembled thereafter. The alignment is performed by dowel pin-hole pairs fabricated on the respective layers. The electrodes are formed on the surface of the electrode layer by Au ion sputtering using a suitable mask, which is also fabricated by a 3D-printer. For grounding the mirror layer, except the contact area with the electrode paths, all the surface is Au ion sputtered. 3D-printers are widely used for creating 3D models or mock-ups. The authors have recently proposed that these models can perform electromechanical functions such as actuators by suitably masking them followed by metallization process. Since the smallest possible fabrication size is in the order of sub-millimeters, these electromechanical devices are named by the authors as SMEMS (Sub-Milli Electro-Mechanical Systems) devices. The proposed mirror described in this paper which consists of parallel-plate electrostatic actuators is also one type of SMEMS devices. In addition, SMEMS is totally environment-clean compared to MEMS (Micro Electro-Mechanical Systems) fabrication processes because any hazardous chemicals or gases are utilized.

Keywords : MEMS, parallel-plate mirror, SMEMS, 3D-printer

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