

Characteristics of Anodic-Bonded Multilayer Ceramic Actuators on Si Wafers for MEMS Applications

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This paper describes the characteristics of anodic-bonded multilayer ceramic actuators (MCA) on Si wafers using sputtered Pyrex #7740 glass thin films for micro-electromechanical-system (MEMS) applications. The Pyrex #7740 glass thin films were deposited on MCA under optimum RF magnetron conditions (Ar:O₂ gas ratio of 100%, input power of 1 W/cm²). After annealing at 450°C for 1 h, the anodic bonding of MCA to a Si wafer was successfully performed at 600 V, at 400°C and –760 mmHg. The properties of the MCA/Si bonded interface and fabricated Si diaphragm deflection were analyzed through the actuation test. It is possible to control with accuracy the deflection of a Si diaphragm according to its geometry; here, a maximum nonlinearity of 0.05–0.08% FS was observed. Moreover, no damage or separation of MCA/Si bonded interfaces occurred during the actuation test. Therefore, it is expected that anodic bonding technology of MCA/Si wafers could be usefully applied to the fabrication process of high-performance piezoelectric MEMS devices.

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