

Fabrication of Electrostatic Microdevices by the LIGA Technique

C. Burbaum, J. Mohr, P. Bley and W. Menz

Kernforschungszentrum Karlsruhe
Institut für Mikrostrukturtechnik
Postfach 3640, D-7500 Karlsruhe 1, Germany

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The conventional LIGA process (LIGA is an abbreviation of the German words Lithography, Galvanoformung and Abformung) has been combined with a sacrificial layer technique to allow the fabrication of movable microstructures with great structural heights and arbitrary lateral shape. As first examples of this new technique, a capacitive acceleration sensor and an electrostatic comb drive have been fabricated. The results of the static and dynamic measurements of the capacitive acceleration sensor are in good agreement with theoretical calculations. Damping of the sensor at atmospheric pressure is relatively low. The static behavior of the electrostatic comb drive can be described by using a simple parallel-plate capacitor model.

1. Introduction

Most micromechanical devices presently known are fabricated by the well-known silicon technology.⁽¹⁾ In the case of anisotropic etching, the geometry of these structures is restricted by the crystallographic morphology of the material. In the case of polysilicon etched by reactive ion etching, the height of the devices is limited to only a few micrometers.^(2,3) The LIGA (Lithography, Galvanoformung and Abformung) process, which is presently being developed at the Karlsruhe Nuclear Research Center and will be commercialized by MicroParts GmbH, Karlsruhe, allows the fabrication of microstructures of arbitrary lateral shape with dimensions down to one micrometer and structural heights of several hundred