Ferroelectrics, 2001, Vol. 263, pp. 101–106
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DESIGN AND FABRICATION OF THE MICRO-ACCELEROMETER USING PIEZOELECTRIC THIN FILMS

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(Received in final form August 3, 2001)

This paper discusses the design and the fabrication procedure of a novel design of microaccelerometer. The proposed design consists of a seismic mass suspended with quadri-beams and the patterned displacement transducers using piezoelectric thin films. The electromechanical system model is presented to illustrate the interactions of material characteristics, amplification circuit designs, and microstructure geometry. The micromachining processes of the microstructure are proposed. Due to the anisotropic property of the wet etching process, the geometry of the microstructure presents a particular configuration. Major manufacturing concerns are presented. For a 1900μm × 1900μm microstructure, analytical predictions show the natural frequency around 23 KHz and the pre-amplification sensitivity of 0.03 (mV/g). The analytical results coincide with the FEM analysis.

Keywords: Microsensor; Piezoelectric; Accelerometer; Sensor Design; MEMS.

INTRODUCTION

MEMS technology has successfully applied silicon micromachining to the fabrication of different types of microaccelerometer. Electric and mechanical subsystems can now be integrated into one chip, which facilitates the applications with space constraints. The miniaturization of sensors not only reduces the manufacturing cost but also improves the operational bandwidth and reliability. Successful examples mainly