Fabrication and Characterization of a Bulk Micromachined Polysilicon Piezoresistive Accelerometer

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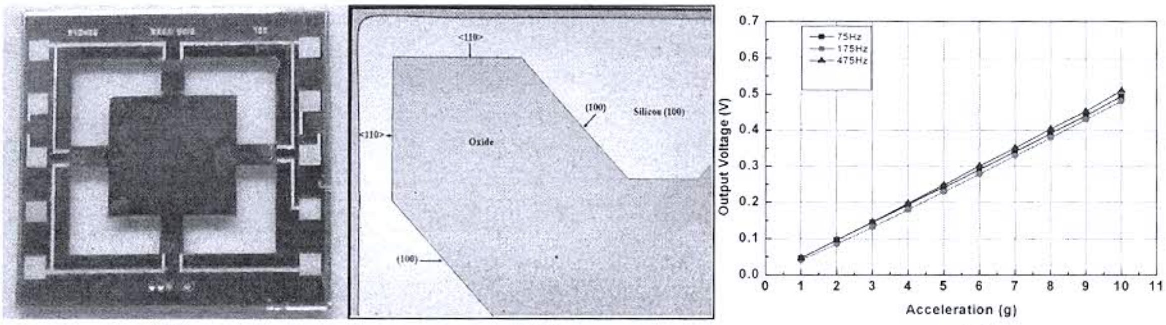
In this work, the fabrication and characterization of a MEMS bulk micromachined piezoresistive accelerometer. For transduction, polysilicon piezoresistors are used. Polysilicon piezoresistors are preferred over SOI-based silicon piezoresistors because they are cost effective [1]. The accelerometer is designed using FEM-based MEMSCAD tool CoventorWare®. The accelerometer sensor is realized using a hybrid approach of wet and dry bulk micromachining techniques and is shown in Figure 1 (a). <100> bar corner compensation technique [2] was used for the back side bulk micromachining of the accelerometer structure as shown in Figure 1 (b). The developed process is CMOS compatible, and can be extended for CMOS-MEMS integration. Interface electronics required for the Wheatstone bridge signal readout is also presented. The developed sensor is characterized for static and dynamic performance, using nano-indenter and electrodynamic shaker, respectively. From static characterization, stiffness and natural frequency are found to be 7.25 kN/m and 6.78 kHz, respectively. From dynamic characterization, bandwidth and sensitivity are found to be 475 Hz and 10 mV/V/g, respectively. The acceleration vs output voltage graph is shown in Figure 1 (c).



(a) (b) (c)

Figure 1. (a) Top view of fabricated accelerometer sensor (b) <100> bar compensation structure patterned on Si wafer (c) Acceleration (g) vs. Output Voltage (V).

References

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