

Design of MEMS Based Polymer Microphone for Hearing Aid Application

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Abstract

In this work, a MEMS based condenser microphone [1,2] using Polyimide as the diaphragm has been designed. The microphone structure has a backplate placed on top of the diaphragm. The backplate and the diaphragm are made up of polyimide. The two polyimide plates are separated by air gap which is achieved by using Aluminium as a sacrificial layer in between, which is etched away to create the air gap and where the etch holes in the backplate function as the necessary acoustic holes in the finished microphone [3]. Two gold electrodes are used to apply voltage to carry out electrical modeling and also to give it to the read out circuitry. The COMSOL Multiphysics tool has been used to simulate the movement of the diaphragm with the application of Pressure and voltage. From the same the change in capacitance with respect to change in pressure / voltage can also be derived. The figure 1 shows the complete structure of the MEMS microphone. The simulation results which shows the change in displacement with with application of voltage is shown figure 2.

Reference

- [1] Kovacs and A. Stoffel, Integrated condenser microphone with polysilicon electrodes, Proc. Micromechanics Europe 1995 (MME'95), Copenhagen, Denmark, pp 132-135.
- [2] J.J.Bernstein and J.T. Borenstein, A micromachined silicon condenser microphone with on- chip amplifier, Proc. Solid – State Sensor and Actuator Workshop, Hilton Head, SC, USA, 1996, pp 239- 243.
- [3] Michael Pedersen, Wouter Olthuis, Piet Bergveld, “A Silicon Condenser microphone with polyimide diaphragm and backplate”, Sensors and Actuators A: Physical, ISSN 0924-4247, 1997, pp. 97-104.

Figures used in the abstract

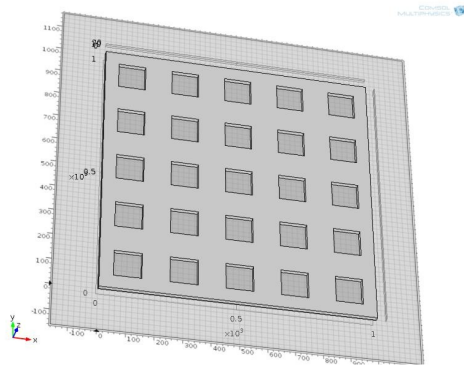


Figure 1: Structure of the Microphone.

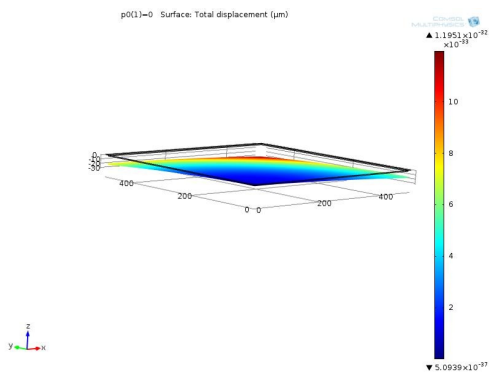


Figure 2: Displacement versus pressure.