A Condenser Microphone for Consumer Application

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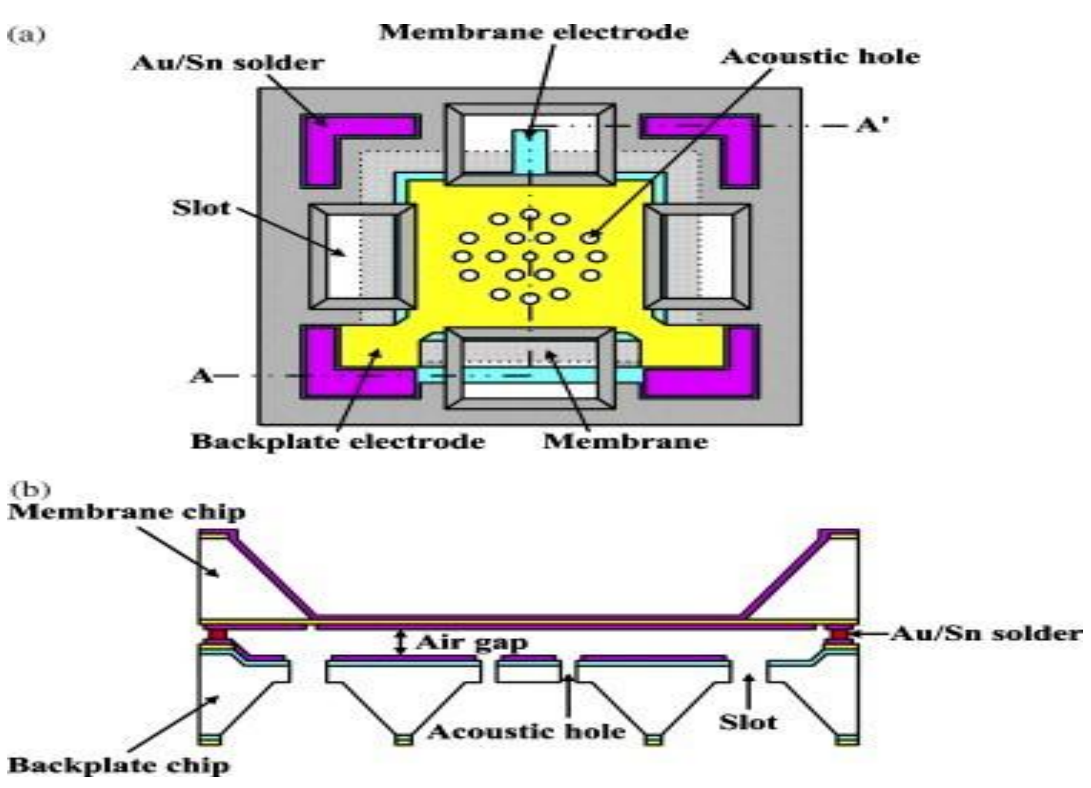
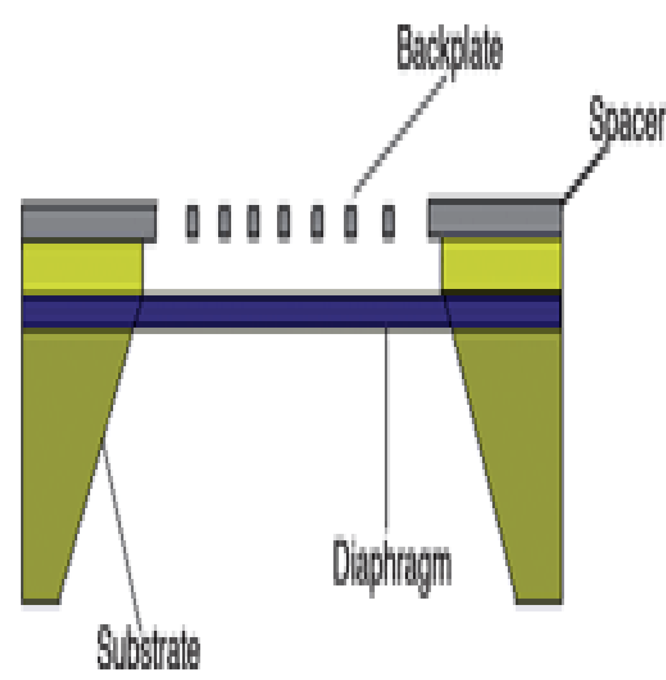
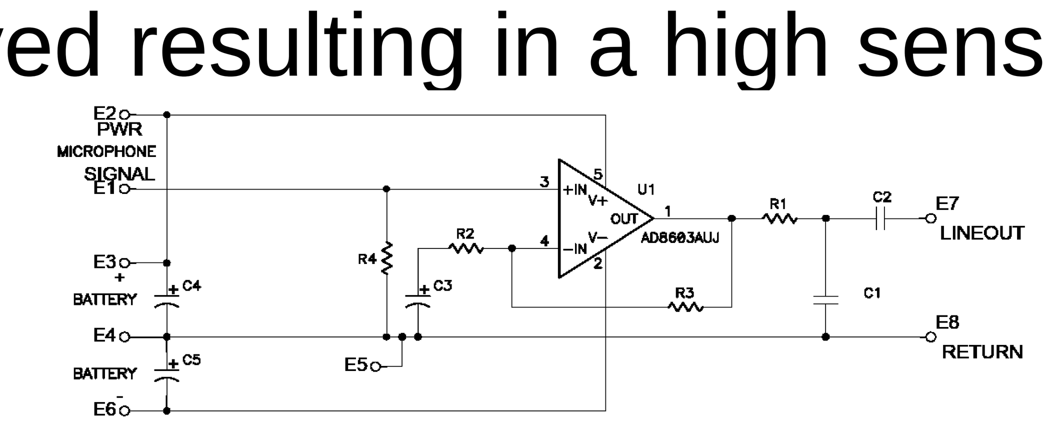
Introduction: MEMS microphones have been around for more than twenty years, but have been slow to achieve high volume commercial success. One possible reason for this is the availability of very low cost electret condenser microphones that meet the performance requirements of most consumer applications

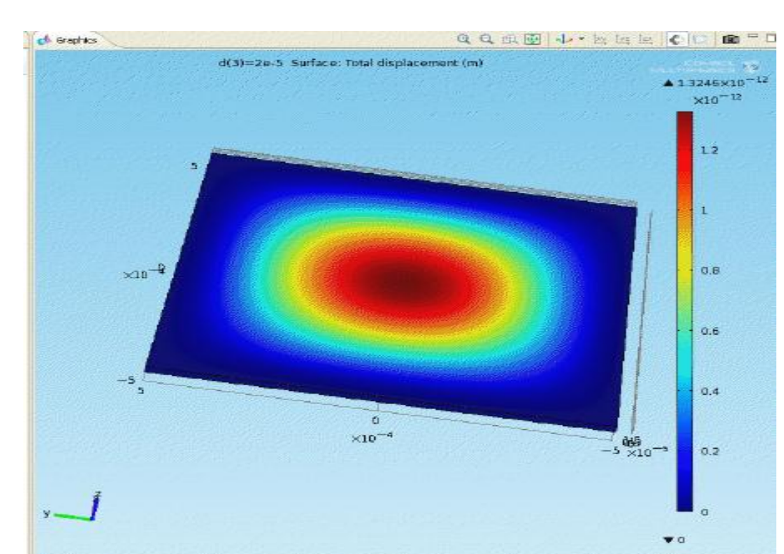


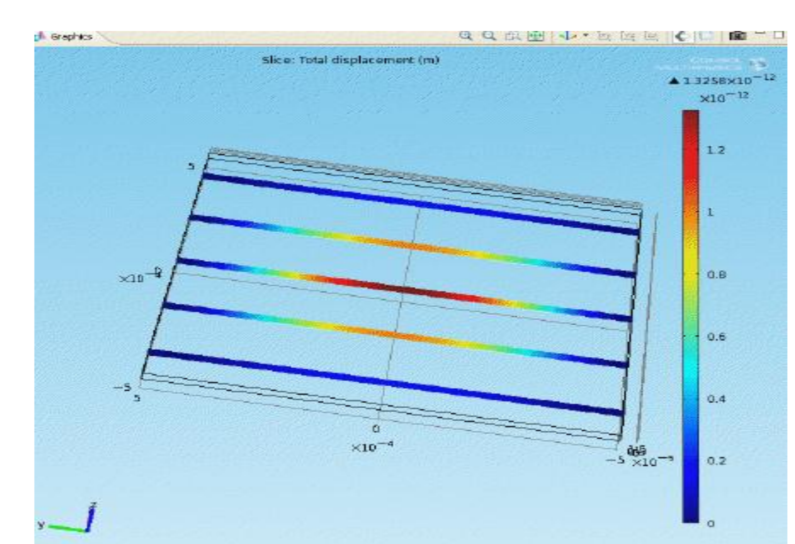


Computational Methods:Trenches are etched in the device layer of an SOI wafer and then refilled with silicon dioxide and polysilicon. These trenches will later be the perforations in the backplate. Since the backplate is formed from the device layer of the SOI wafer, its thickness can be precisely controlled. Silicon dioxide is then deposited which will serve as one of the sacrificial layers and determine the capacitive gap of 3 μm. The polysilicon diaphragm is deposited and then contact regions are patterned, followed by
metal deposition. A scanning electron micrograph of the microphone diaphragm and one of its springs is shown in figure 3 Finally, the cavity is etched into the back of the microphone and XeF_2 as well as HF are used to release the diaphragm. The cavity allows a high diaphragm compliance to be achieved resulting in a high sensitivity



CHARACTERIZATION: Currently, the MEMS microphone does not integrate electronics on chip and thus must have a separate interface chip to provide the desired output. However, the Designed' SOIMEMS inertial sensor process could be modified to integrate circuitry with the sensor.[13] A prototype discrete amplifier circuit was designed in order to verify and demonstrate the microphone. The circuit uses an Analog Devices AD8603 low noise, CMOS operational amplifier and is shown in figure. Small in size and offering
sufficient dynamic performance, the amplifier circuit has been adequate for sound reproduction and initial dynamic performance characterization. The circuit works by translating the microphone's change in capacitance to a proportional voltage change through charge conservation .





Conclusions:The Conclusion of the experiment is that a MEMS Condenser Microphone was constructed using COMSOL Multiphysics Version 4.1 and different conditions of the microphone was tested using the software. Mainly the membrane analysis and sensitivity analysis was carried out using COMSOL Software and the results obtained was upto the expectations of the Researchers and the results were tallied with various international journals and the results obtained was according to the international Results.

References:[1] D. Hohm, "Kapazitive Silizium-Sensoren fur Horschallanwendungen", Fortschritt-Berichte VDI, VDI, Dusseldorf, 1986.
[2] P.R. Scheeper, A.G.H. Van der Donk, W. Olthuis, and P. Bergveld, "A Review of Silicon Microphones", *Sensors and Actuators A,* vol. 44, pp. 1-11, 1994.
[3] Prismark Partners LLC, "The Prismark Wireless Technology Report", www.prismark.com, March 2005.
[4] J. J. Neumann Jr. and K. J. Gabriel, "A Fully Integrated CMOS-MEMS Audio Microphone", in *Digest Tech. Papers Transducers '03 Conference*, Boston, June 8-12, 2003, pp. 230-233.