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TOUCH MODE MICROMACHINED CAPACITIVE PRESSURE SENSOR WITH SIGNAL CONDITIONING ELECTRONICS

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Background

In the last decades, pressure sensors have been one of the greatest successes of the MEMS industry. Many companies are using them in a variety of applications from the automotive to the environmental field. Currently piezoresistive pressure sensors are the most developed, and a well established technology to design and fabricate these sensors has been implemented. Capacitive pressure sensing, on the other hand, is still an open and really promising field.

Results

Capacitive microsensors were designed and fabricated (Fig. 1) and an analytical model for touch mode regime, which fitted accurately the measurements done on the devices, was investigated. Fabrication was carried on at Danchip cleanrooms where fusion bonding was used in order to obtain a thin silicon plate on top of a sealed vacuum cavity (Fig. 2).
A viable signal conditioning scheme for capacitive pressure sensing was simulated and implemented. A measurement setup was arranged and tested for accuracy and reliability with respect to hysteresis. Finally, designs with different radii of the top plate were characterized by a capacitance versus pressure curve at different frequencies and temperatures (Fig. 3).

Industrial possibilities

Energy saving systems is one of the key challenges nowadays. In this context, house heating is a priority for environmental issues. For this reason, the possibilities of using a low power consumption technique, such as capacitive pressure sensing, in harsh environments is a concrete market opportunity. Our aim is therefore to develop new technologies based on capacitive sensing to be able to fulfil future requirements in this field.

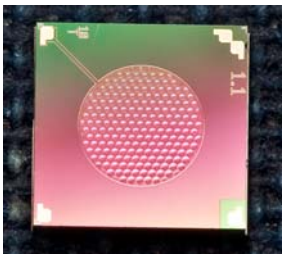

Figure 1. *Fabricated sensor.*

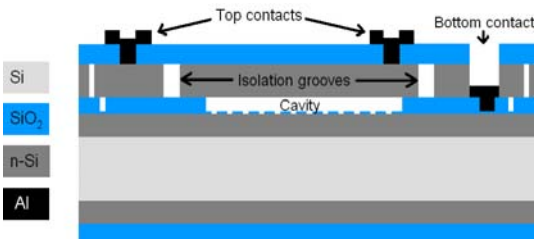

Figure 2. *Schematic of the sensor layers.*

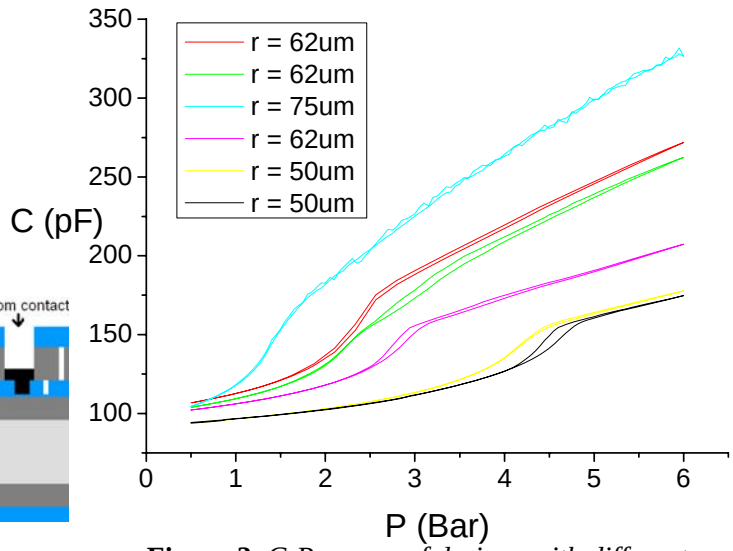

Figure 3. *C-P curves of designs with different membrane radii (T = 25°C, f = 1KHz).*