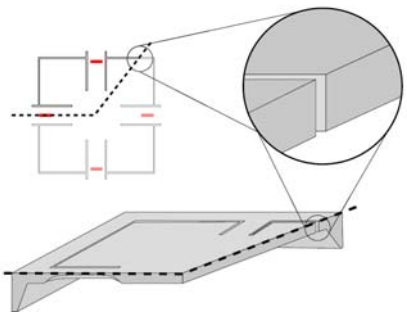
Piezoresistive microphone for photo-acoustic gas detectors

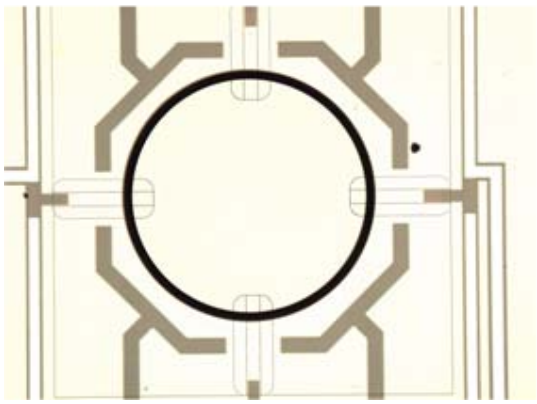
The piezoresistive microphones presented here for photo-acoustic gas sensors aims at decreasing the size and increasing the sensitivity for CO2 monitoring in ventilation systems. Because the system must be small to fit inside the valves of the ventilation system, the commonly used method of signal enhancement, acoustic resonance cannot be used and hence must the microphones be even more sensitive if miniaturization is to be successful. By releasing the microphone membrane along its edges, compliance is increased. To further enhance low frequency performance, the openings resulting from the release should be as narrow and deep as possible. By combining the MultiMEMS MPW process and the DRIE process offered as a add-on by SINTEF, microphones with 23 µm deep opening along the membrane perimeter has successfully been fabricated. For these first generation devices, characterization shows a potential for very high performance microphones, but that challenges with respect to the frequency response, remains.

The partners involved were

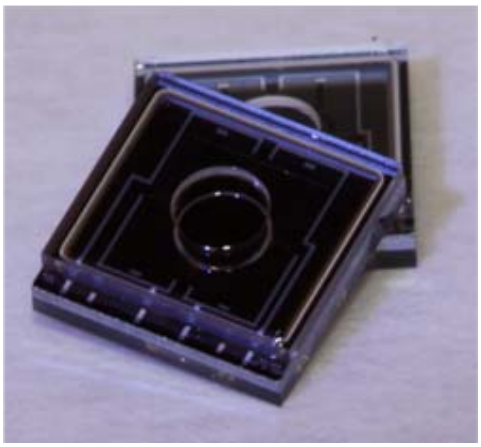
- VUC: design and characterization
- COREP: design and characterization
- SensoNor: manufacturing using MultiMEMS technology
- SINTEF: DRIE add-on processing



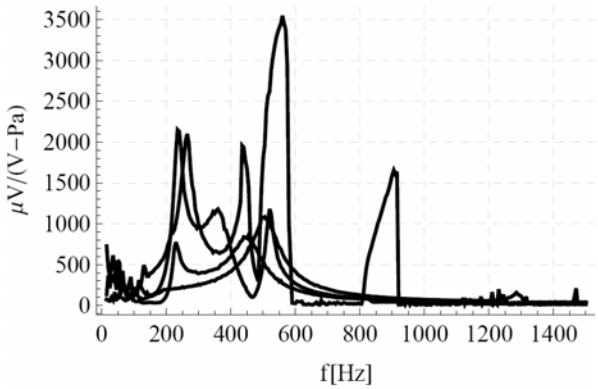
3D sketch of key design features: thin beams supporting a thick membrane perforated with narrow deep slots. CoventorWare simulations



Top view micrograph of the fabricated microphone.



Finalized die



Measured sensitivity for 4 microphones

Contributing partners

VESTFOLD UNIVERSITY COLLEGE COREP SensoNor SINTEF

www.microBUILDER.org