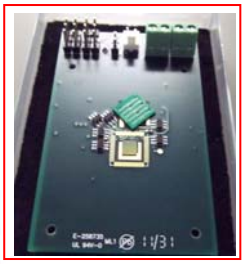
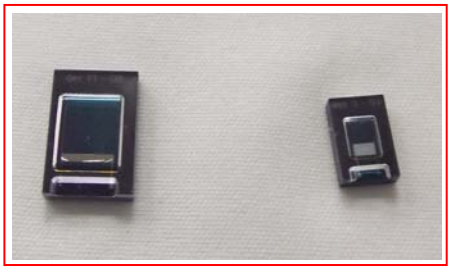




Imec, The Netherlands

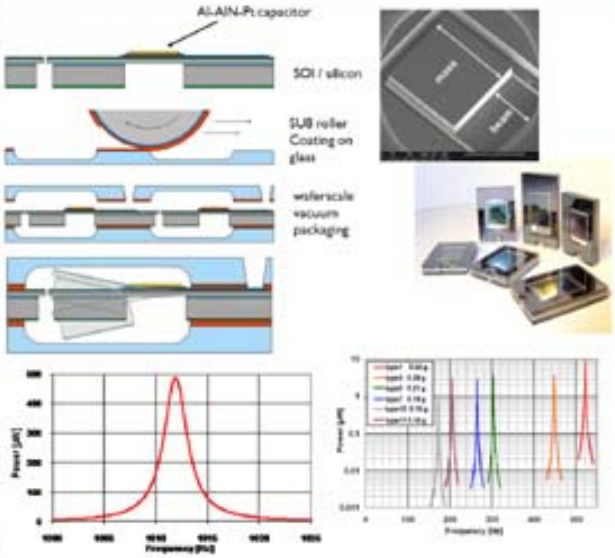
MEMS FOR ENERGY HARVESTERS & ELECTRONIC NOSE

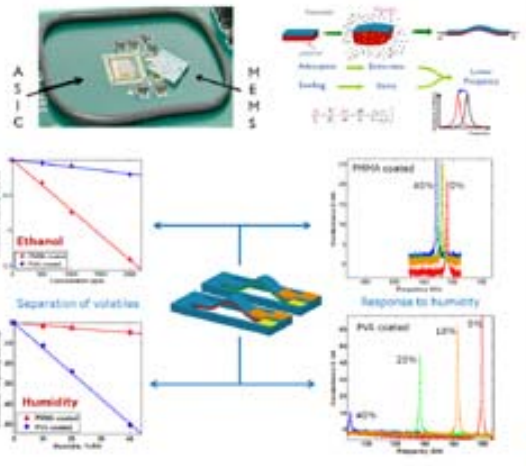
Background

Wireless sensor nodes are able to operate autonomously, for extended periods of time, provided they are equipped with Ultra Low Power components, and their energy is supplied by energy harvesters. For both the sensors as well as the harvesters, MEMS fabrication by bulk machining is an enabling technology.

Energy Harvesting

The **Piezo Vibration Harvester** is processed on SOI wafers. An Al-AlN-Pt is deposited and subsequently the beam and mass are defined using DRIE. The devices are vacuum packaged with two glass wafers with a cavity. Roller coating is used for this process. Several devices have been designed, each with their own resonance frequency (between 200Hz and 1 kHz). The maximum power output has been 489µW at an input acceleration of 4.5g.





Ultra Low Power Electronic Nose

MEMS cantilevers are traditionally used for mass based (bio-)sensing as the resonance frequency shifts when molecules adsorb.
Here, an electronic nose based on the response of an array of MEMS resonators is developed, where each resonator is coated with a different polymer and thus reacts differently when exposed to the environment. This approach, where swelling of the polymers gives a stress induced resonance shift, is significantly more sensitive (~300x compared to mass based sensing), thus enabling detection of low-mass volatiles with a scalable MEMS array. Additionally, a dedicated ASIC is developed that actuates the device through a piezo-electric patch, and tracks the resonance frequency.

Holst Centre