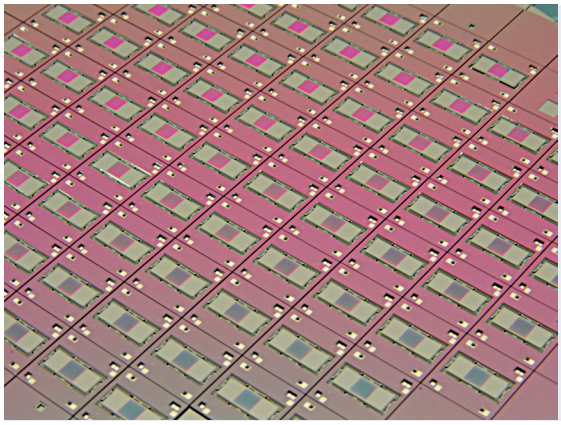
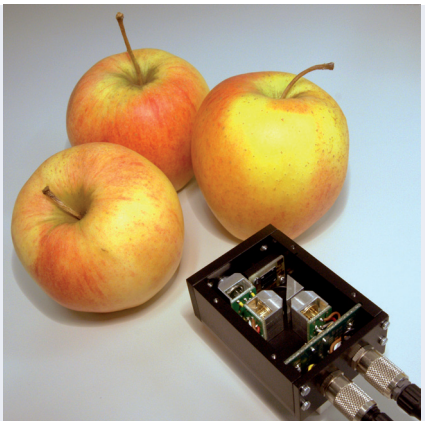
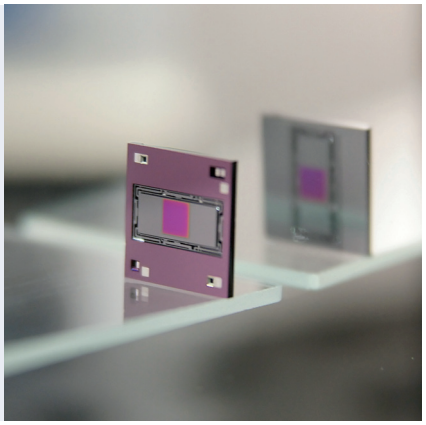
MINIATURIZED TUNABLE BAND-PASS FILTERS FOR THE INFRARED SPECTRAL RANGE







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Description

Electrically tunable band-pass filters for the infrared spectral range are suitable for many spectral analysis based devices in medical, industrial and safety applications, e.g. determination of gas concentrations or spectral imaging. Fraunhofer ENAS developed in cooperation with the Center for Microtechnologies of Chemnitz University of Technology and InfraTec GmbH miniaturized filters for the spectral range from 3 µm to 11 µm. In a silicon wafer batch process the filters are fabricated very cost-efficient. The full width at half maximum (FWHM) bandwidth of the filters is 50 nm to 200 nm and depends on the interference order used. The pass-band can be tuned electrically in a defined spectral range (e.g. 11 µm to 8 µm) and has a maximum transmittance of more than 70 per cent. The filters are made of two equal and movable reflector carriers, which minimize the influence of vibration and gravitation induced forces on the reflector spacing and hence the central wavelength of the pass-band. The tunable infrared filters are based on the Fabry-Pérot interferometer and are designed and fabricated as MOEMS (micro-opto-electro-mechanical system) with chip dimensions of 8.5 mm x 8.5 mm x 0.6 mm (width x length x height).

Applications

- Infrared spectral analysis
- Analysis of gases (e.g. determination of concentration)
- Spectral imaging

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TECHNISCHE UNIVERSITÄT CHEMNITZ
InfraTec

Specifications

Description	Value	Unit
	3–5	µm
spectral range	5–8	µm
	8–11	µm
transmittance	>70	%
band width (FWHM)	50–200	nm
control voltage	15–60	V
aperture	2x2	mm²
chip size	8.5x8.5x0.6	mm³

Tab. 1: shows the most important characteristics of the developed and fabricated Fabry-Pérot interferometers.

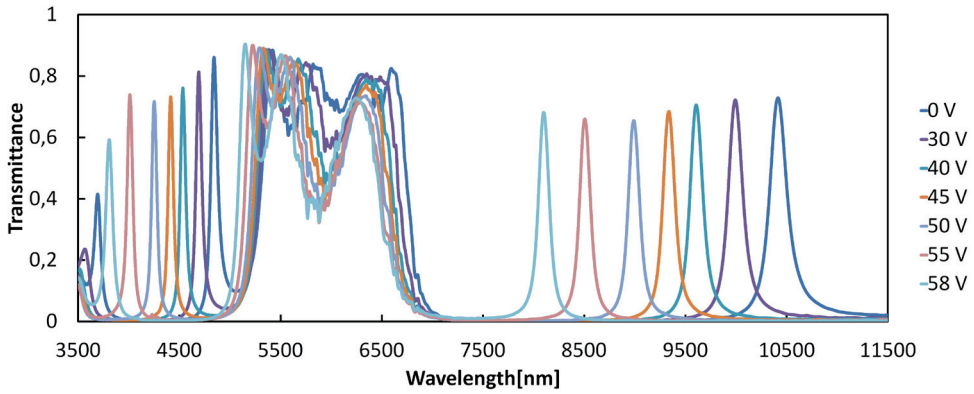

Fig. 1: measured transmittance spectra of a dual-band Fabry-Pérot interferometer for different control voltages. The wavelength ranges from 4 µm to 5 µm and from 8 µm to 10.5 µm can be used simultaneously.

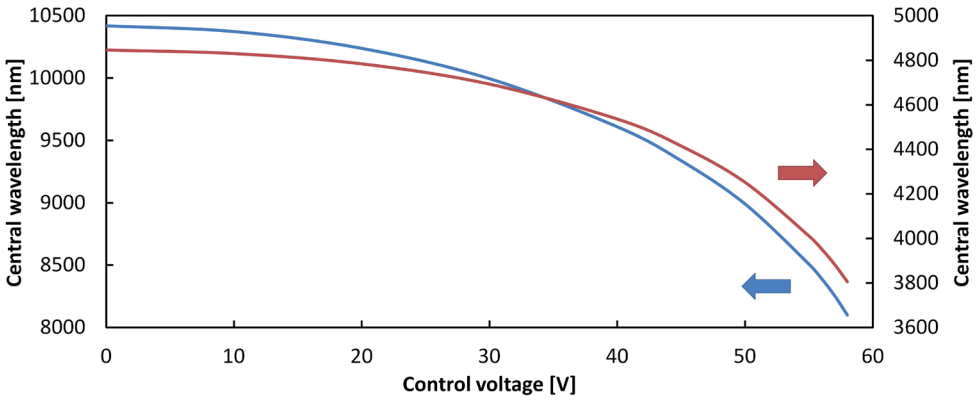

Fig. 2: Central wavelength as a function of control voltage on the example of a dual-band Fabry-Pérot interferometer for the wavelength ranges from 4 µm to 5 µm (red curve) and from 8 µm to 10.5 µm (blue curve).