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1 *Interdigital capacitors
on glass wafer*

ELECTROCHEMICAL TRANSDUCER

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Applications

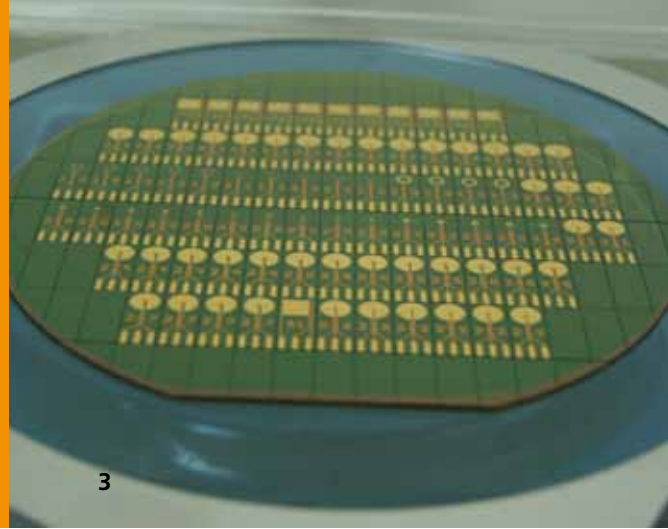
Fraunhofer EMFT boasts a long-term experience and broad technological know-how in production of electrochemical transducers (electrodes) on silicon, glass and polymer foils. These components provide a basis for the implementation of compact and energy-efficient (bio-)chemical sensors for a wide spectrum of applications, e.g.

- Chemical sensors for environmental monitoring of e.g. ambient air quality
- Biological sensors for life sciences, medical and food technology
- Monitoring oil quality
- Intelligent sensor filters, for measuring cells and particles

Technical innovation

Methods of microelectronics and microsystem technology are optimally suited for producing compact and high performing electrochemical transducers and systems. For this purpose Fraunhofer EMFT deploys precious metals such as gold or platinum, together with organic conductors and nanomaterials. These are applied onto silicon, glass, ceramic or flexible foil substrates by means of thin film or printing technologies. The special focus of Fraunhofer EMFT lies on developing flexible and individual solutions tailored to the needs of the customer, e.g.

- Development of single transducers and sensor systems
- Implementation of customer-specific applications
- Integration with the communication systems of the customer



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Service offering

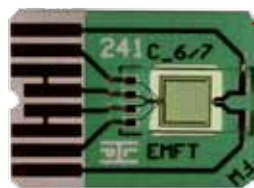
- Electrochemical electrodes (gold and other metals, 2D-nanomaterials, organic conductors) for amperometry, voltammetry and potentiometry
 - Interdigital electrodes for electrochemical impedance spectroscopy and capacitive sensors
 - Silicon MEMS as carrier for electrochemical electrodes
 - Packaged electrodes as basic components for gas sensors, liquid analysis and biological sensors
 - Configurable, application-specific measurement electronics, e.g. as an USB stick
- Customer-specific fluidics for embedding into systems
 - Support for model-based and multi-variant analysis of the measure of data
 - Partner for development of customer-specific electrodes through to complete applications
 - Comprehensive experience and measurement technology for characterization of (bio-)chemical sensors

Outlook

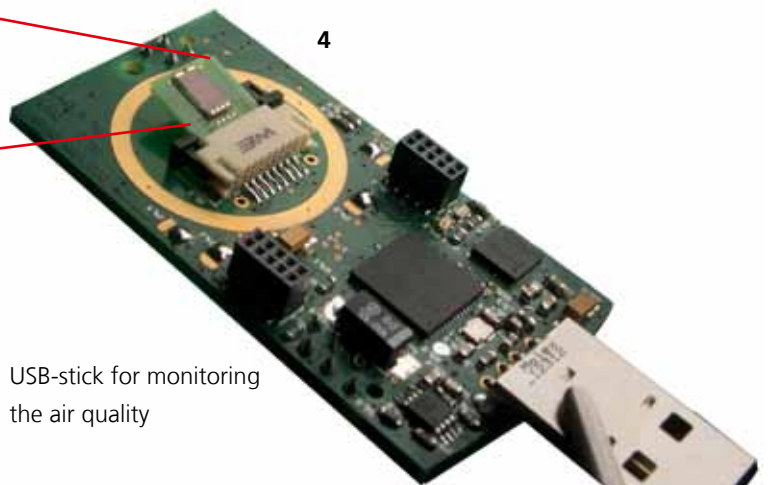
The know-how for developing compact sensors is a key enabler for future applications in the fields of Industry 4.0 and IoT.

CO₂-sensor

An energy-efficient, highly sensitive CO₂ sensor (0 - 3000 ppm) for mobile devices has been developed by Fraunhofer EMFT. For this purpose, the sensor, capacitance/digital converter and microcontroller for signal analysis were assembled on a circuit board then embedded in a USB stick (Fig. 4). A filter installed in the casing protects the sensitive layer from contamination. The humidity, temperature and CO₂ concentration of the ambient air are displayed on an integrated OLED display.



Sensor component for measuring humidity and CO₂



USB-stick for monitoring the air quality

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2 Fraunhofer EMFT scientist holding a glass wafer with interdigital capacitors

3 Elektrochemical transducers (working-electrode, counter electrode, reference electrode) thin film gold on glass substrate