

Sensor Laboratory

INFN-CNR, Brescia University

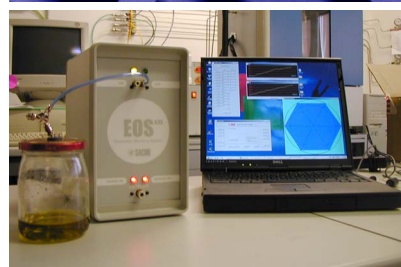
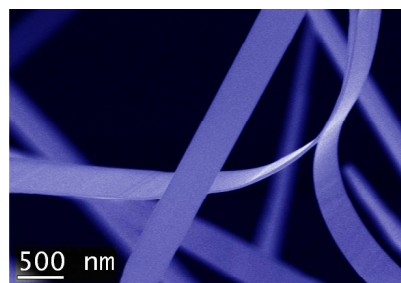
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The SENSOR Lab originates from the Gas Sensor Lab (GSL) active since 1987. The main scientific tasks of the SENSOR Lab are the preparation and functional characterisation of gas/flavour sensors based on semiconducting (SC) thin films and the development of the Artificial Olfactive System (AOS).



The materials for gas sensing that are investigated cover a wide spectrum of metal oxides, like SnO_2 , In_2O_3 , TiO_2 , Ga_2O_3 , porous silicon, and several mixed oxides, like $\text{SnO}_2\text{-In}_2\text{O}_3$ and $\text{TiO}_2\text{-WO}_3$. New research seed activities have recently started towards nanostructured systems with reduced dimensionality like semiconducting quantum nanobelts, Porous Silicon and Carbon Nano Tubes. The activity is devoted both to the study of fundamental gas sensing properties and to their application for industrial needs.

An array of gas sensors is the core of the Artificial Olfactory System (AOS) or Electronic Nose. The Sensor Lab has developed its own AOS, called Pico, the know-how has been transferred to the Sacmi company, which has produced its first engineered prototype, the EOS 835. One necessary component of the AOS is data analysis. A research line on learning from data has been developed, comprising explorative analysis and supervised learning (e.g. with linear techniques and neural networks).



Instrumentation and Research Facilities

Materials Preparation

- Two magnetron Sputtering (both dc and rf modes) equipped with load-lock systems;
- A thermal evaporation plant equipped with cryogenic pumps;
- A Spin Coating System provided with a Programmable Logic Controller;
- A furnace for high temperature deposition of semiconducting nanobelts;
- Two stations for ageing of the samples.

Characterization

- Four advanced systems for the measurement of sensors response to gas mixtures at controlled humidity, temperature and light exposure conditions. The instrumentation allows to monitor many parameters as sensors response: electrical conductivity, work function, photoluminescence and reflectance spectra;
- An AFM with six standard SPM modes: AFM, LFM, NC-AFM, IC-AFM, Phase and STM;
- A SEM-FEG equipped with ETD, IN-LENS, BSE, STEM and EDX detectors.

Artificial Olfactory System

The Sensor Lab has developed two version of its own AOS, which have been successfully tested for food processing control (e.g. coffee quality control), and for environmental monitoring (e.g. quantification of malodors in landfill sites).

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