# European Network on New Sensing Technologies for Air Pollution Control and Environmental Sustainability - *EuNetAir*

## COST Action TD1105

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**Function in the Action** – MC member



ESF provides the COST Office through a European Commission contract

# Nanotechnologies & Magnetic Nanoparticles Based Sensors

**Background / Problem statement:**

- **Nanostructured photonic sensors**

  **High optical quality c-axis oriented ZnO thin films were grown by pulsed laser deposition on quartz (amorphous or 001) substrates using an excimer XeCl laser source. The ZnO films are sensitive to butane (down to 100 ppm diluted in air or $N_2$).**
- **Development of nanotechnology for creating nanosized monodomain magnetic particles. Were investigated the possibility to envelop the magnetic particle with functional organic molecules and build up a hybrid particles.**
- **To use a magnetic field sensors in combination with magnetic nanoparticles working as magnetic labels for detecting molecular recognition. The challenges are related to array of probe molecules and immobilize them over a magnetic field sensor, and the biomolecules (target analyses) to be detected are magnetically labeled and pass over the probe array. The target material acts as a link between the nanoparticles and the magnetic field sensor and the presence of the target is detected by the stray fields from the nanoparticles.**

**Brief reminder of MoU objectives:** "To provide platform between scientists in the field of materials, nanotechnology and sensor systems …, aiming to improve best practices in AQC and explore the potential role of new generation of low-cost sensing devices.".

# Suggested Priorities for future research

- Pulsed laser deposition of thin oxide films.
- Development of nanotechnologies for preparation of hybrid magnetic nanomaterials.
- Investigation of magnetic bioxides produced by various iron oxidizing bacteria.
- Investigation of magnetic  properties and creation of functional particles for magnetic based sensors.

# Research Facilities

Physical Properties Measurements System
Model PPMS

Temperature Control

Temperature range 1.9 to 400 K
Continuous Low Temperature Control
Maintains temperatures below 4.2 K
Smooth sweeps through 4.2 K
Uniform sample chamber temperature
No temperature gradient problems
Uses multiple thermometers

Magnetic Field Control

Very high homogeneity 9 Tesla magnet
0.01% uniformity 5.5 cm x 1 cm volume
9 Tesla Longitudinal, Low noise, high efficiency, bipolar power supply
Allows continuous charging through zero field
Up to 150 Amps

Atomic and Magnetic Force Microscopy (Veeco)