GAS SENSORS FOR ENVIROMENTAL MONITORING

COST ACTION TD1105

3 RD NEW SENSING TECHNOLOGIES FOR AIR-POLLUTION CONTROL AND ENVIRONMENTAL SUSTAINABILITY –

Bahcesehir University, Istanbul, 3-5 December 2014

Sadullah ÖZTÜRK

Function in the Action (Participant) / sadullahozturk@gyte.edu.tr

Gebze Institute of Technology/TURKEY

COST is supported by the EU Framework Programme

ESF provides the COST Office through a European Commission contract

MOTIVATION

- Human can affects the **NATURE** no way to be reversible,
- Harmful effects of us;
  - Industrial Activities,
  - Starvation to Energy,
  - Personal Requirements
    - Transportations,
    - Settlings
    - Wastes
- Nature MUST be traced with reliable, stable and on line systems,
- **Enviromental Monitoring;**
  - Air,
  - Water,
  - Soil,

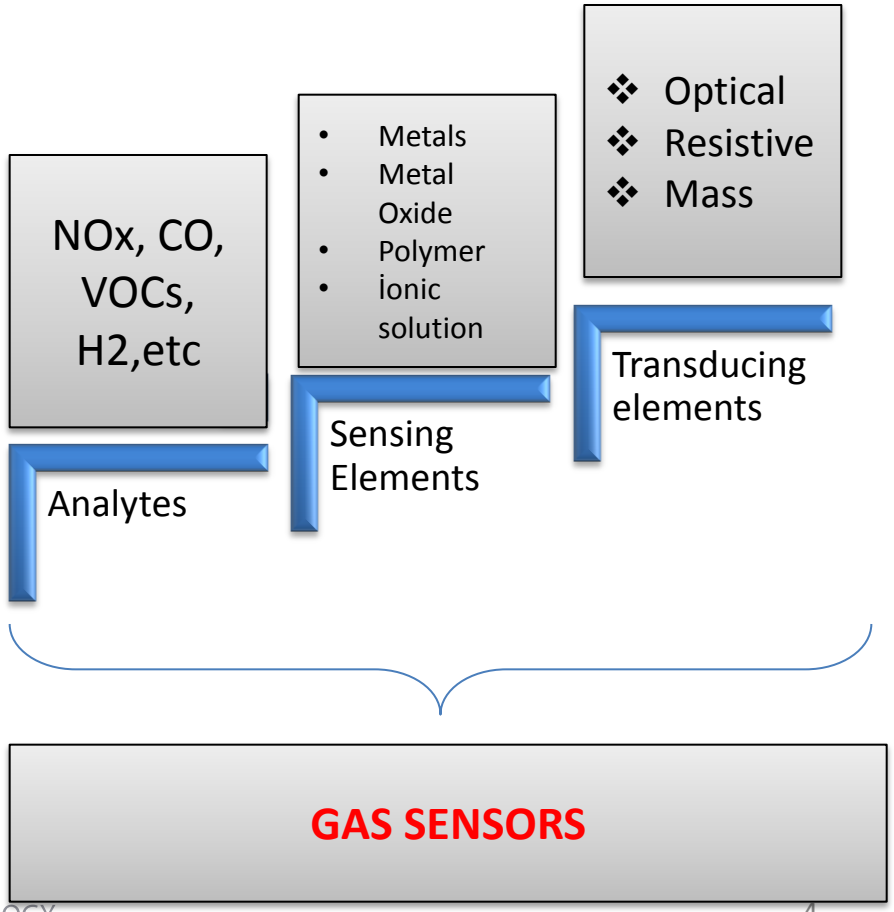
Enviromental Monitoring

- Air quality monitoring
- Soil monitoring
- Water quality monitoring
- Design of environmental monitoring programmes
- Parameters
  - ❖Chemical
  - ❖Biological
  - ❖Radiological
  - ❖Microbiological
  - ❖Populations

Gas Sensors

- What is gas sensors:

- Chemical sensors consist of a recognition element that is sensitive to stimuli produced by various chemical compounds (analyte) and a transduction element that generates a signal whose magnitude is functionally related to the concentration of the analyte.
- In general, the chemical sensors are broadly classified into gas, liquid, and solid particulate sensors based on the phases of the analyte.
- Categorized as optical, electrochemical, thermometric, and gravimetric (mass sensitive) sensors according to the operating principle of the transducer.



Gas Sensors Types

Properties	Sensor Types				
	Semiconductor	Catalytic	Electro chemical	Thermal Conductance	Optical adsorbance
Sensitiviy	m	i	i	z	m
Selectivity	z	k	i	k	m
Sensor Response	m	i	z	i	z
Stability	i	i	k	i	i
Cost	m	m	k	i	m
Mass Production	m	i	z	i	k
Life	i	i	z	i	m

M: excellent; i: good; z: poor; k: bad

Analytes

- ***Odorable or Non-odorable***
- **Colorful or colorless**
- Mostly «HARMFUL» effects on human and nature
- Source:
  - Industry,
  - Transportation,
  - Consuming fossil fuels,

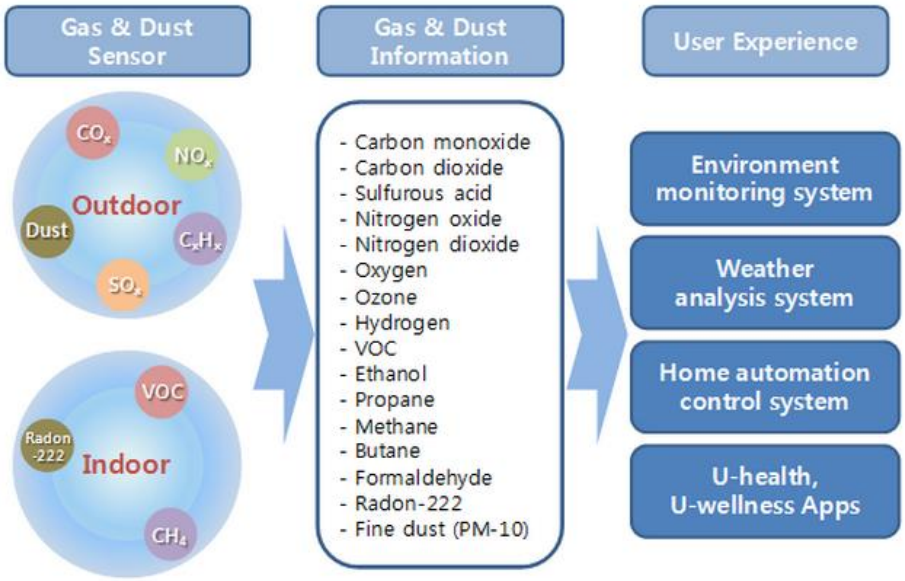
❑ **GLOBAL WARMING**

❑ **THINNING OF OZONE LAYER**

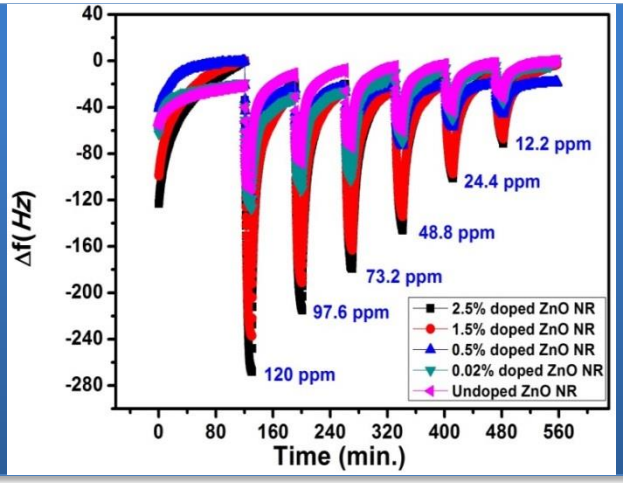
Gas	Limit Value(ppm)
CH_4, C_3H_8, …Natural Gas	800-10000
H_2	100-1000
CO	100-1000
Humidity (H_2O)	1000-100000
H_2S	0.1-100
NH_3	1-500
$(CH_3)_3N$	10-200
CH_3SH	0.1-10
Alcohols	1-1000
Volatile Organic Compounds (VOCs)	1-10
SO_2	0.1-10
NO_2	0.1-10
CO_2	100-10000
O_3	0.1-10

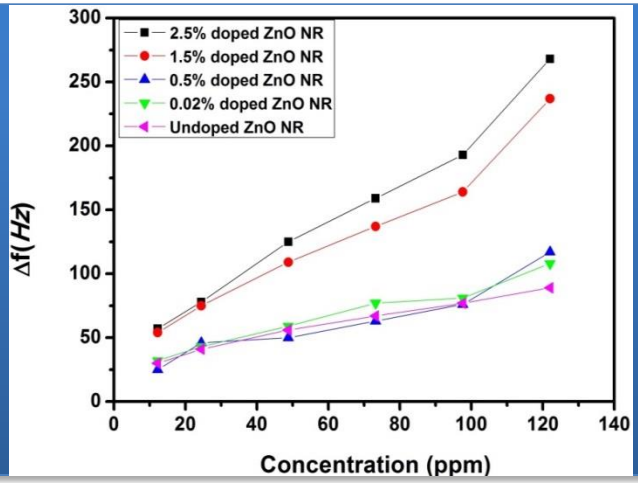
Gas Sensors for Enviromental Monitoring

- Tracing gas molecules (analytes) by gas sensors
  - Air
  - Water
  - Soil
- Roads
- Lanfill
- Industrial Complexes

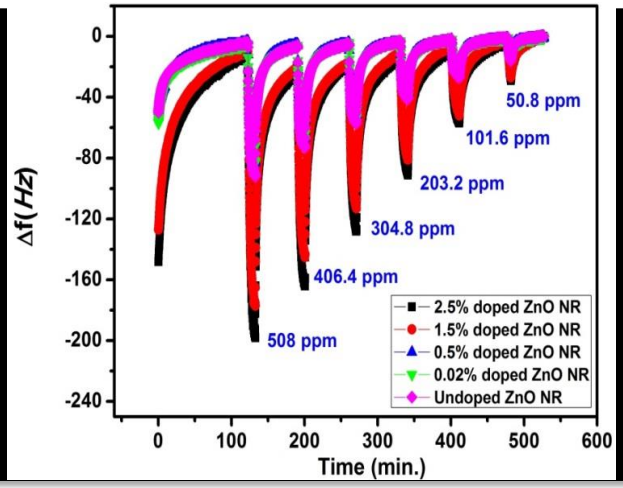


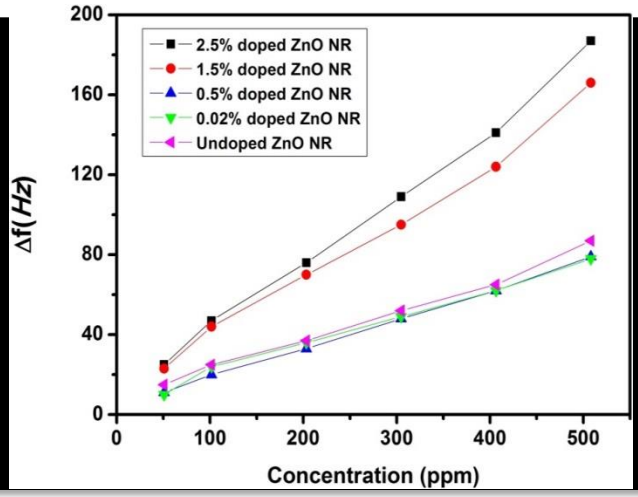
Gas Sensing Measurement





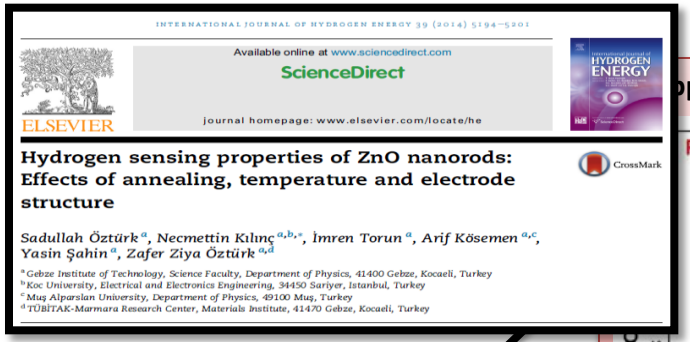
Ethanol

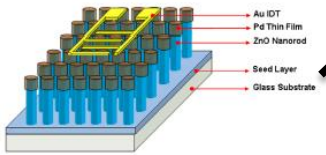


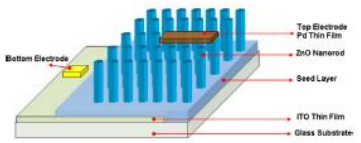


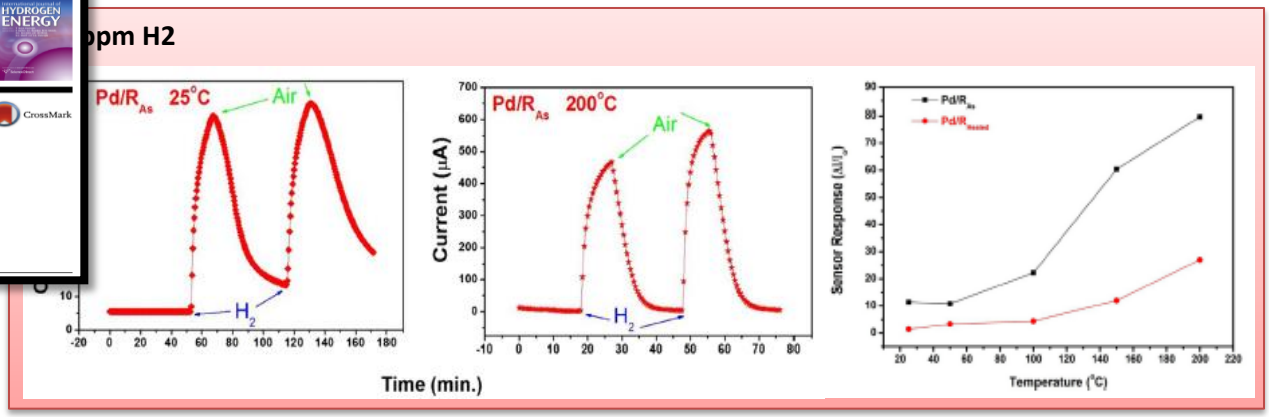
Ethyl Acetate

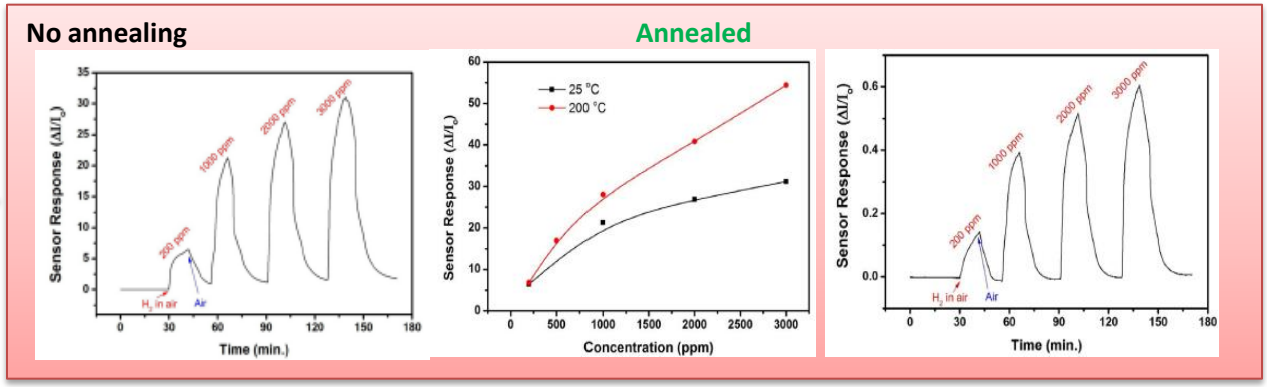
- Pd functionalized-ZnO Nanorods











RESULTS

- Enviromental Monitoring systems indispensable part
  - Of our technology driven society
  - For our health and the future of world, nature

The Scientific and Technological Research Council of Turkey (**TUBITAK**). Project title: "***Development of Automotive Gas Sensors Based on Nano-Metal-Oxide Semiconductor with increased Selectivity, Sensitivity and Stability***"

COST Action TD1105 ***EuNetAir*** **- European Network on New Sensing Technologies for Air-Pollution Control and Environmental Sustainability**


Thank You For
Your Kind
Attention