

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

COST Action TD1105

INTERNATIONAL WG1-WG4 MEETING on

New Sensing Technologies and Methods for Air-Pollution Monitoring

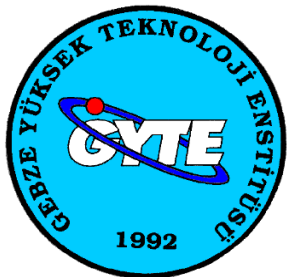
European Environment Agency - EEA

Copenhagen, Denmark, 3 - 4 October 2013

POSTER SESSION

Action Start date: 01/07/2012 - Action End date: 30/06/2016 - Year 2: 2013-2014

Metal Oxide Heterostructures for Gas Sensor Applications



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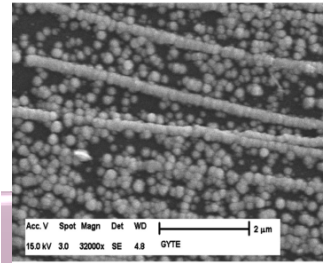
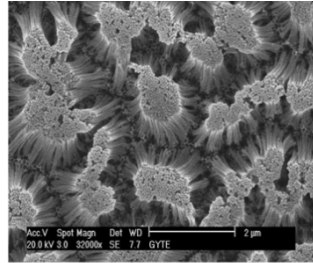
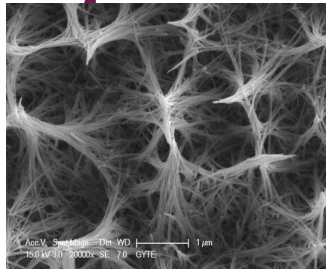




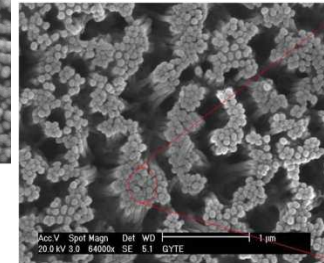
Vertically Pd Nanowires

Horizontally Pd Nanowires

TiO₂ Nanowires



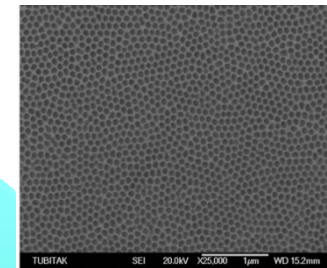
ZnO Nanowires



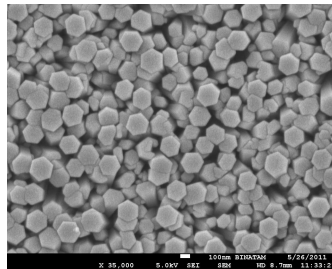
NANOWIRES

GAS
SENSOR

AAO Nanotubes



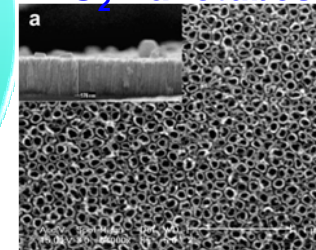
ZnO Nanorods



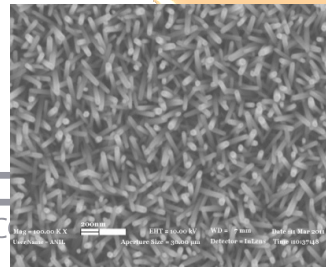
NANORODS

NANOTUBES

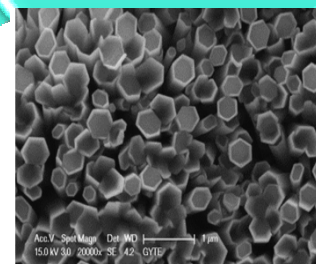
TiO₂ Nanotubes



ZnO Nanorods



ZnO Nanotubes





Purpose



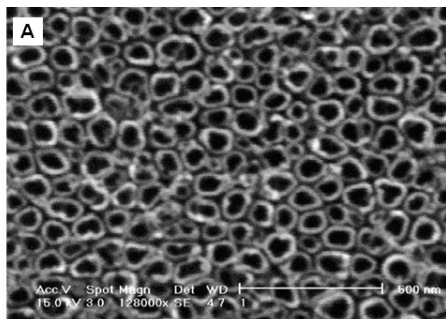
- ❖ **Sensitivity**
- ❖ **Selectivity**
- ❖ **Stability**
- ❖ ...



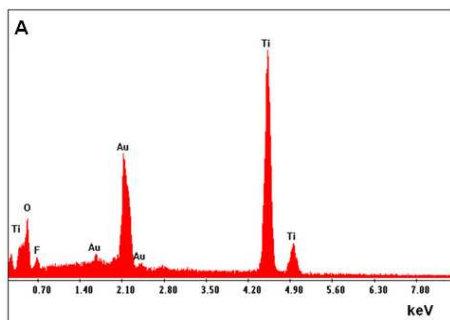
- **Promoting of sensing properties of metal oxides**
 - Decreasing working temperature.
 - Increasing sensitivity.
 - Enhancing selectivity.



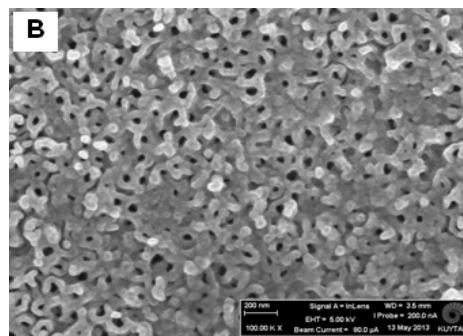
Anodization



Annealed: 500 °C 3 h in dry air

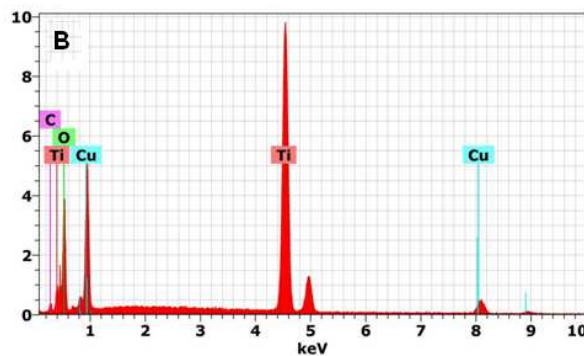


Evaporation & Calcination

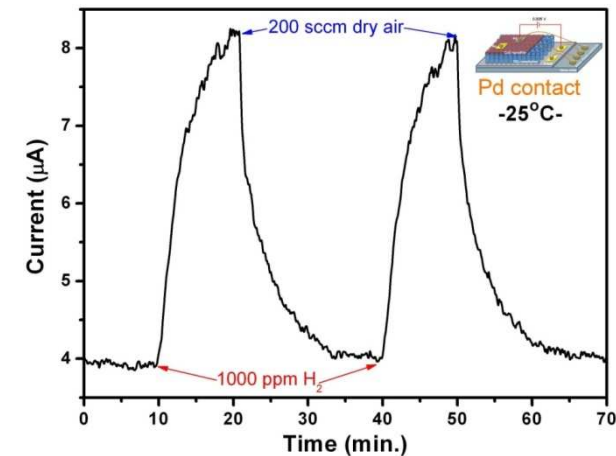


Annealed: 300 °C 5 h in dry air

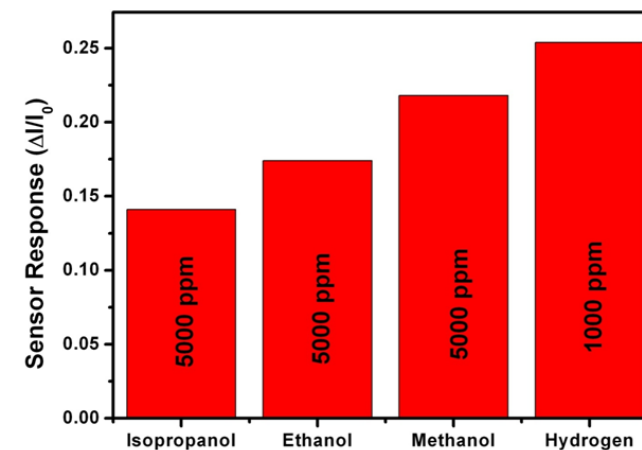
Cu₂O crystal form



Gas Sensing



25 °C, Pd contact, 1000 ppm H₂



200 °C, Au contact,
5000 ppm VOC, 1000 ppm H₂

Conclusion

- Cu_2O thin film/ TiO_2 nanotubes heterostructures were fabricated for gas sensor applications.
- Pd and Au contact measurements were performed and observed the effect on gas sensing.
- The sensitivity of gas measurement on Pd contact is better, because of Pd catalytic effect.
- The selectivity is observed with Pd contact by only sensing H_2 gas.
- In low temperature, the sensitivity is unmeasured due to not observe catalytic effect with Au contact.
- Although Cu_2O sensed H_2 by decreasing the conductivity, $\text{Cu}_2\text{O}/\text{TiO}_2$ nanoheterostructure sensed by increasing



...THANK YOU FOR KIND ATTENTION...