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

COST Action TD1105

1ST TRAINING SCHOOL

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organized by UB, MIND-IN2UB - Dept. of Electronics and CSIC-IDAEA

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Expertise

- **Pd nanowires:** Fabrication, characterization and gas sensing properties
- **TiO_2 nanotubes/nanowires:** Fabrication, characterization and gas sensing properties

Project Name	Date	Project Type
Research and Development of nanotechnological Hydrogen Sensors	01.02.2007-01.02.2010	National
Interaction of Volatile Organic Compounds (VOCs) of different Phthalocyanine Molecules by Spectroscopic and Quantum Chemical Methods	15.11.2009-15.11.2011	National
Development of Automotive Gas Sensors Based on Nano-Metal-Oxide Semiconductor with increased Selectivity, Sensitivity and Stability	15.10.2011-15.10.2014	International

Aim

Development of Automotive Gas Sensors Based on Nano-Metal-Oxide Semiconductor with increased Selectivity, Sensitivity and Stability.

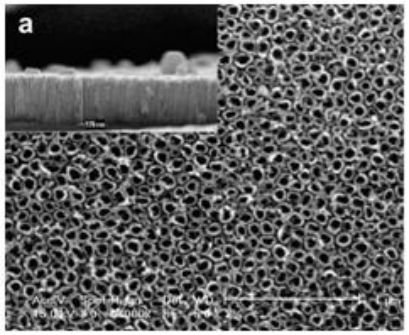


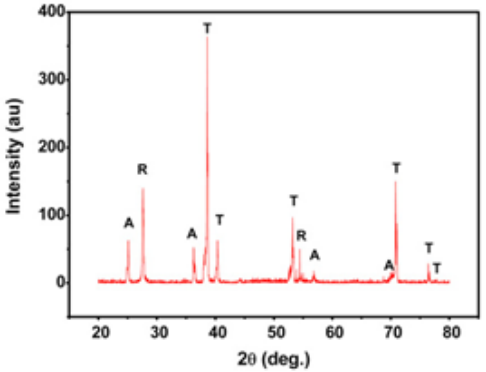

Synthesis of doped and undoped TiO_2 nanostructures

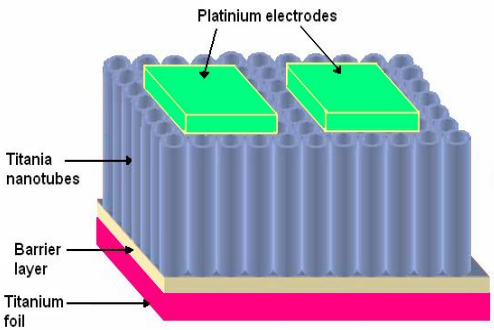
Structural Analysis of these (SEM, EDX, XRD, XPS)

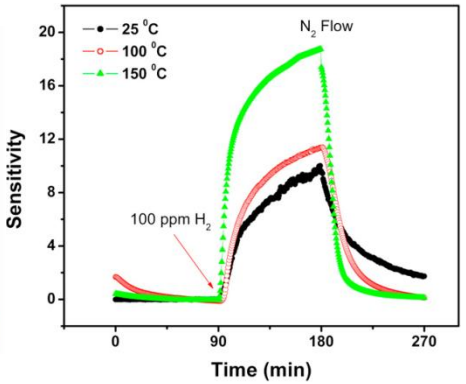
Gas tests

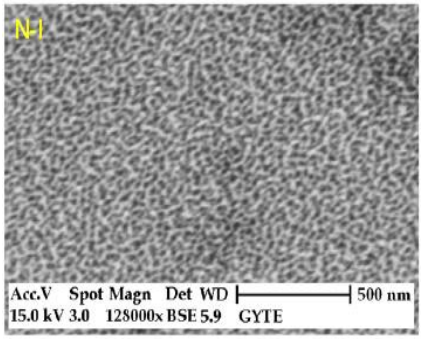
TiO_2 nanotubes (on Ti foil/thin film)

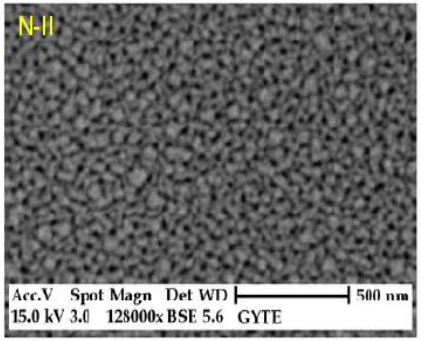


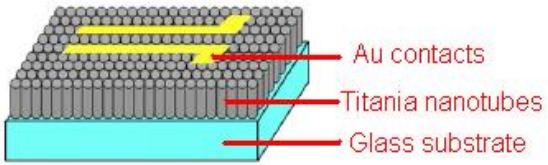


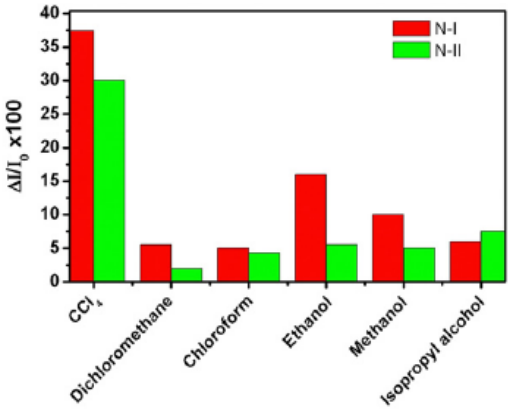








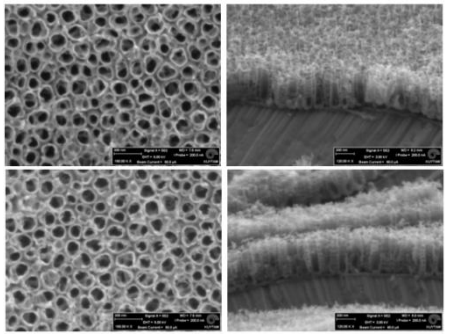


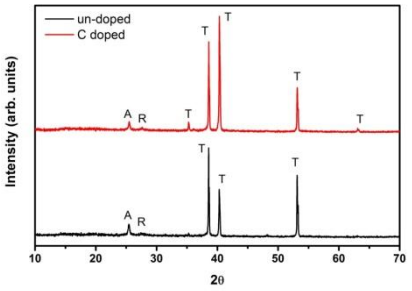


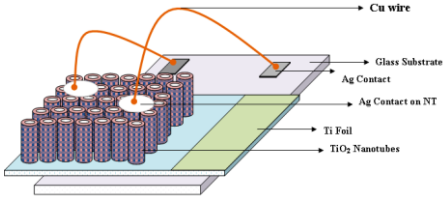
Erdem Sennik, Zeliha Colak, Necmettin Kılınc, Zafer Ziya Ozturk, *Synthesis of highly-ordered TiO2 nanotubes for a hydrogen sensor*, International journal of hydrogen energy 35 (2010) 4420–4427.

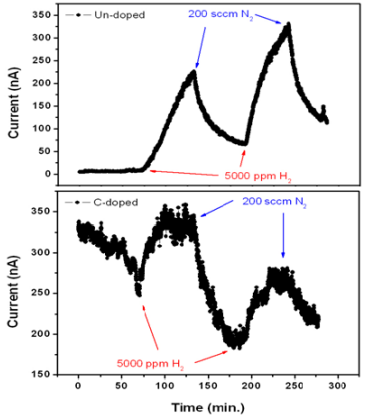
N. Kılınç, E. Şennik, Z.Z. Öztürk, *Fabrication of TiO_2 nanotubes by anodization of Ti thin films for VOC sensing*, Thin Solid Films 520 (2011) 953–958.

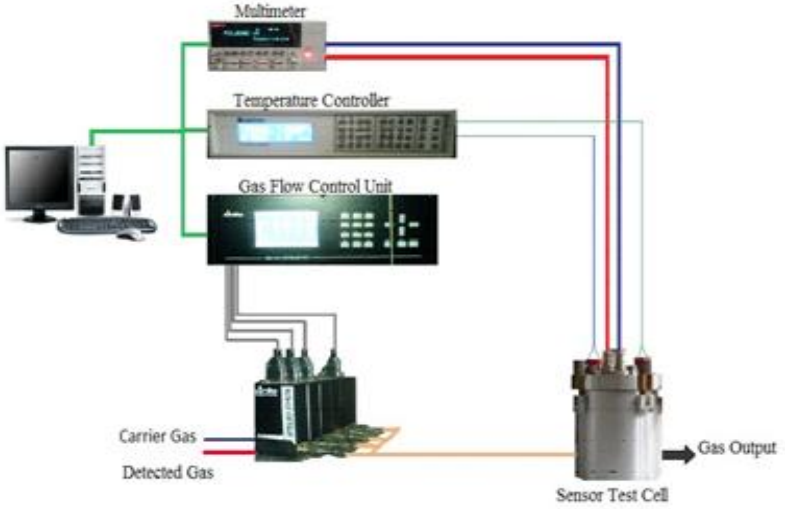
Doped and Undoped TiO_2 Nanostructures











Necmettin Kılınç, Erdem Sennik, Müge Işık, Ali Sems Ahsen, Osman Öztürk, Zafer Ziya Öztürk, ***Fabrication and gas sensing properties of C-doped and un-doped TiO2 nanotubes***, Ceramics International, ACCEPTED.

RESULTS

- TiO_2 nanotube arrays (1 μm in length and 90 nm in pore diameter) on Ti foil are fabricated with the anodization method using an aqueous HF electrolyte.
- The sensitivity increases from 10 (25 ^{0}C) to 18 (150 ^{0}C) with increasing temperatures under exposure to 100 ppm H_2.

- TiO_2 nanotube arrays are fabricated by anodization of Ti thin films with different anodization solutions depending on anodization temperatures and anodization voltages.
- The maximum sensor response to VOCs is observed for N-I TiO_2 nanotube sample due to its high porosity and thinner tube wall thickness.

CONCLUSIONS

- TiO_2 nanostructures are sensitive to H_2, VOC.
- TiO_2 nanostructures are become more sensitive by doping
- Working temperature of sensor can be increased by doping.
- My aim is to investigate gas sensing properties of TiO_2 nanostructures after doping (Future work).