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SESSION 1 – *Advanced materials for sensing technologies*

ORAL PRESENTATION

WO_3 Nanoflakes Based Sensors for Selective Detection of Ethanol

E. Spagnoli [1*], M. Valt [1], B. Fabbri [1], M. Ardit [1], V. Cristino [1], M. Della Ciana [1], A. Gaiardo [2], S. Krik [1, 2], G. Zonta [1], S. Caramori [1], C. Malagù [1], and V. Guidi [1]
[1] University of Ferrara
[2] Bruno Kessler Foundation

Ethanol is an important chemical raw material widely used in chemical industry, medicine, cosmetics, paints, and biofuels. It is also volatile and flammable, and its inhalation can cause headache, drowsiness, and difficulty in breathing. It derives that the precise quantitative detection of ethanol vapours is of interest for many applications. Among the wide palette of the metal oxides, tungsten oxide (WO_3) is a promising candidate for alcohols detection because different combinations of crystal structure and morphology can tune the sensing properties of the WO_3-based sensor.
In this work, the synthesis of WO_3 nanoflakes (WO_3-NF) was achieved via solvothermal route [1]. The peculiar morphology was characterized by SEM microscopy (Fig. 1a). Sensing performance of the WO_3-NF were studied and compared to those of WO_3 nanoparticles (WO_3-NP) synthetized by precipitation method. The dynamic response to different concentration of ethanol (Fig. 1b) clearly highlights the enhanced sensing performance of the WO_3-NF based sensor when compared to that of the WO_3-NP. The sensing response towards 50 ppm of methanol, ethanol and butanol are shown in Fig. 1c. Interestingly, while WO_3-NP response increases with the length of the alcohol chain, this trend is not observed for WO_3-NF, which has higher response for ethanol. A correlation between the film response and three counteracting effects bounded up to the alkyl carbon length will be proposed.

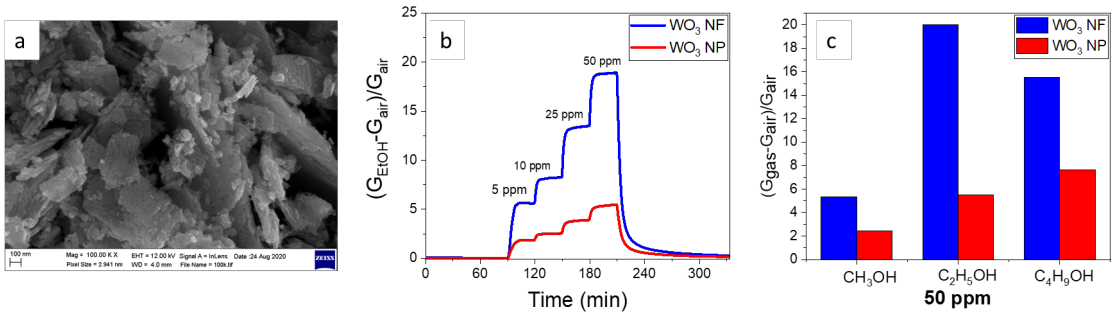

Fig. 1a- SEM image of WO_3 nanoflakes; **b-** dynamic responses at ethanol concentrations varying from 5 to 50 ppm; **c-** responses of WO_3 NF and WO_3 NP towards 50 ppm of methanol, ethanol and butanol.

[1] C. A. Grimes et al., *Nano Letters*, **11**, (2011) 203-208

Corresponding Author and *lead presenter e-mail: spglne@unife.it