Enhanced aldehydes detection by ZnO nano-tetrapod based gas sensors.

R. Mosca[1], D. Calestani[1], M. Zha[1], A. Zappettini[1], M. Zanichelli[1], and L. Zanotti[1]
[1]IMEM - CNR, Parco Area delle Scienze 37/A, Parma, 43124, Italy

Metal oxides are very important materials in gas-sensing and the possibility to obtain them as crystalline nanostructures represents an essential chance to improve sensors sensitivity an lifetime.
Zinc oxide (ZnO) is a versatile material that is today widely studied because of the large number of possible application fields. The availability of this material in a large number of nanostructures makes it very interesting for the realization of gas sensors. In this field ZnO nano-tetrapods can find a suitable and reliable application, since they can be obtained by vapour phase growth, starting from metallic Zn, with very large yield and low production costs.
In the present work authors report the excellent results obtained in: (i) developing an optimized growth process for the production of ZnO tetrapods, (ii) realizing a gas sensing device based on these nanostructures and (iii) the very promising results obtained in the detection of some volatile organic compounds (VOC).
In particular a very high response and a remarkable sub-ppm detection limit is demonstrated for aldehydes. Furthermore, the reaction mechanisms, which take place on the surface of ZnO tetrapods, are discussed as a function of temperature and it is shown that the response curves measured at different temperatures can provide a powerful tool for adding selectivity to aldehydes detection towards particular interfering compounds (e.g. alcohols).