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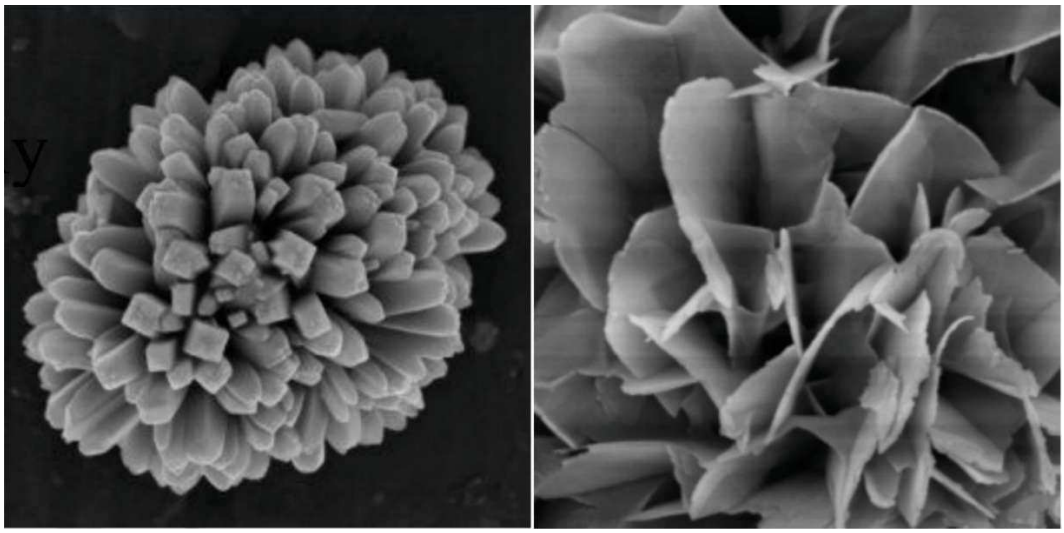
PERSPECTIVES OF FLOWER-LIKE SnO_2 NANOSTRUCTURES FOR GAS SENSING APPLICATION

SnO_2 one of the most promising materials for metal oxide gas sensors. Despite the rather high performance of the sensors based on tin (IV) oxide, the studies for improving such characteristics of the device as sensitivity and selectivity still continue.

Physical and chemical properties have the significant influence on the potential application of the material. It is know that characteristics of SnO_2 nanostructures strongly depend on their morphology. It have been already shown that the trantisiton from nanosized zero-dimentional tin (IV) oxide nanostructures to the wirelike one-dimentional SnO_2 nanomaterials changes not only their structural and physical properties, but also reflected in the difference of optical and electrical characteristics, what leads to the higher sensor response of tin (IV) oxide sensitive layers [1].

Recently attention of researches have been attracted by the flower-like SnO_2 nanostructures due to their high specific surface area and excellent properties. The combination of 1D and 2D nanoscale building blocks lead to the formation of 3D hierarchical flower-like nanostructures that often display the novel functionalities [2]. And the application of flower-like tin (IV) nanostructures in the senstivive layers of gas sensors results in the high sensitivity and short recovery time of the device [3].

The shape of flower-like nanostructures also have a huge influence on the finite properties of the material. For the obtaining of flower-like SnO_2 structures different methods such as sol-gel, chemical vapor deposition, thermal evaporation tecnique, hydrothermal synthesis are used. At this moment different 3D tin (IV) oxide hierarchical structures were synthesized, in particular flower-rod, flower-sheet and sphere-like morphologies [4]. In their work Zeng W. et al [2] synthesized rod-flower and sheet-flower hierarchial SnO_2 nanostructures by the hydrothermal synthesis . In the first case as precursor tin (IV) chloride was used and as the result of nucleation, oriented growth of one-dimenstional SnO_2 and the formation of self-assembly the rod-flower SnO_2 nanostructres were obtain (Fig. 1, a). The synthesis of sheet-flower tin (IV) oxides samples were performed from tin (II) chloride by nucleation, agregation of particles into sheets and self-assemle of the formed sheets into the flower structure (Fig. 1, b).



a ***b***

Fig.1 Flower-like hierarchical SnO_2 nanosructures: (a) rod-flower and (b) sheet-flower [2].

It was found that flower-sheet SnO_2 nanostructures, which consists of well-ordered nanosheets show the higher sensing properties compare to the rof-flower nanostructures, what is connected with higer values of surface-to-volume ratio [2,4]. Thus, the study of synthesis methods which allow to obtain SnO_2 nanostructures of the certain morphology is the important task nowadays.

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