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Studies on different SnO_2 nanostructures for VOC gas sensing

A U Chavan
D Y Patil College of Engineering, India

Semiconductor oxides are a very important class of materials because they possess excellent properties and have seen wide application in various areas of science and technology like solar energy conversion, photo catalysis, gas sensors, and optoelectronics. They have been extensively studied from both experimental and theoretical points of view. Compared with their bulk counterparts, nanostructured semiconductor oxides retain rich morphologies and unusual physical and chemical properties, due to which they have wide potential applications in nanoscale devices. Tin oxide (SnO_2) has been widely studied as an n-type semiconductor; it has a band gap energy of 3.6 eV at room temperature and has been used as a promising material for gas sensors and optoelectronic devices, and as a negative electrode for lithium batteries. Therefore in the present research Tin oxide (SnO_2) nanoparticles have been synthesized by solution combustion synthesis, hydroxide method and hydrothermal route and the effect of different nanostructures and sizes on gas sensing behavior has been studied for toluene gas. Most of the VOCs are hazardous and are known to cause several kinds of diseases like allergies, asthma, cancer and emphysema. Toluene is one of the VOCs. Obtained ultrafine nanoparticles have BET surface area ~41 m^2/gm. Synthesized particles have particle size in the range of 8-20 nm. The degree of agglomeration of SnO_2 nanoparticles is calculated. The nitrogen adsorption-desorption isotherms of the nanoparticles were recorded at 77K.

e: chavan_au@yahoo.co.in