

Effects of Yttrium Doping on Acetone Sensing Properties of Flame-spray-made SnO₂ Nanoparticles

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Abstract. In the present study, gas-sensing properties of flame-spray-made 0-2 wt% Y₂O₃-doped SnO₂ nanoparticles are systematically and selectively studied for detection of acetone (C₃H₆O) which practically occurred in specific applications. Structural characterizations by electron microscopy, X-ray analysis and nitrogen adsorption further confirmed the formation of loosely agglomerated SnO₂ nanoparticles (5-15 nm) with high specific surface area and highly crystalline tetragonal-cassiterite SnO₂ structure doped with Y³⁺ oxidation states. The gas-sensing properties of undoped SnO₂ and Y₂O₃-doped SnO₂ sensors were systematically tested towards C₃H₆O under atmospheric conditions at the working temperature ranging from 200-350°C. Tested results indicated that the optimal 0.2 wt% Y₂O₃-doped SnO₂ exhibited high responses of ~322 to 400 ppm acetone under exposure at working temperature of 350°C in dry air compared with undoped one. Moreover, the optimal Y₂O₃-doped SnO₂ sensors evidently displayed high selectivity against various gas/vapor categories including flammable gases, toxic gas and VOCs. Therefore, Y₂O₃-doped SnO₂ sensors are potential for responsive detections of C₃H₆O at ppm-level but with limited selectivity and may be useful for environmental and biomedical applications.

Keywords : n-type Y/SnO₂, Nanoparticles, Acetone, Acetylene, Sensor.

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