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Low operating temperature ethanol sensor based on SnO_2 hollow nanospheres

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Abstract:
SnO_2 hollow nanospheres with the average size of 200 nm have been successfully prepared through a simple hydrothermal reaction based on Kirkendall Effect. Chemiresistor gas sensors based on thick films of synthesized SnO_2 hollow nanospheres were fabricated by means of screen-printing technology. The gas sensors exhibited a response value of 4.2 for 100 ppm ethanol at low operating temperature (240 ^oC). The fabricated sensors showed a low detection limit, fast response and recovery times and good repeatability. The excellent sensing performance of the sensor to ethanol could be ascribed to the synergistic effect of the hollow nanostructure with a large specific surface area, which benefit ethanol molecules to adsorb/desorb onto/from the surface of SnO_2 as well as the electron transfer. The formation of SnO_2 hollow nanostructure and their possible ethanol-sensing mechanism are discussed in detail. The results prove that the as-synthesized SnO_2 hollow nanospheres can be used as a promising ethanol sensing material.

Key words: SnO_2, hollow nanospheres, ethanol, Kirkendall Effect, gas sensor