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Gas Sensors Based on Oxide Semiconductors with Porous Nanostructures

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Gas sensor as a device composed of sensing material coupled with signal transducer, has been acknowledged as an analytical tool for detection and quantification of inflammable, explosive or toxic gases. The gas sensors based on nanostructured oxide semiconductor endowed with excellent sensing properties have exhibited great potential application in the fields of environmental monitoring, resource exploration, medical welfare, etc.. It is well known that the sensing mechanism of sensor employing oxide semiconductors is mainly that the interactions between the surface adsorbed oxygen species and target gases lead to a change in the electrical conductivity. Therefore, the gas sensing properties of oxide semiconductors are closely related with their composition, crystalline size, and microstructure. In this regard, design and preparation of oxides with novel architectures will be increasingly important in the construction of high performance gas sensors. Due to high specific surface area, low density, and good surface permeability, porous nanostructures oxide semiconductor sensing materials have attracted growing interest in recent years. In our work, we successfully prepared various porous nanostructures oxides and their composites to the construction of high performances gas sensors with enhanced sensitivity, selectivity, as well as lowered detection limit. The subsequent gas sensing measurements explicitly revealed that these oxides and composites manifested superior sensing behaviors (like much higher sensitivity and faster response speed), which can be ascribed to the porous architectures and the synergistic effects.

Summary

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