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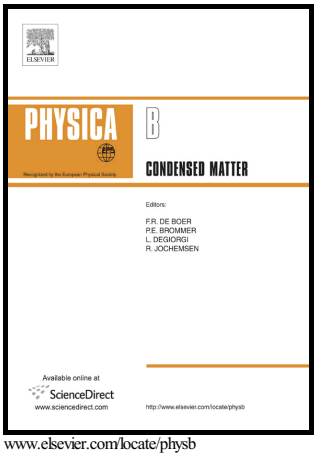

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Synthesis of Ce:ZnO nanocomposites: facile synthesis and fast acetone gas sensing response properties

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Abstract

Semiconductor materials are often used as gas sensor. In order to increase the sensitivity of the sensors, rare earths are usually doped to change the properties of the materials. In this paper, it is reported that the Ce:ZnO nanoparticles are synthesized by a simple chemical methods. The gas sensing properties is investigated. UV-Vis is used to investigate the optical properties. X-ray diffraction (XRD) and field emission scanning electronic microscopy (FESEM) are employed to examine the chemical composition and microstructures. It is found that the size of ZnO crystallites is suppressed after doping Ce. When considering a variety of volatile organic compound gas and gas concentration, 2% Ce-doped ZnO nanocomposites is configured as high performance sensors to detect acetone. The fast response times (< 2 s) and recovery times (12 s) are obtained. Relatively low working temperature, good repeatability and high sensitivity performances are observed. From the morphology characterizations of the Ce-doped ZnO nanocomposites, it can be found that the increasing of ratio of area to volume to enhanced capability of adsorbing oxygen on the surface. It is proposed that the oxygen species on the surface of ZnO nanocomposites is O-, but O- may play a more important role in improving gas response. The morphology dependent sensing mechanism is proposed.

Keywords: Ce doped ZnO， nanoparticles， gas sensor， volatile organic compounds， response times.