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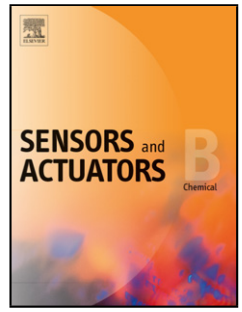

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Enhanced CO_2 gas-sensing performance of ZnO nanopowder by La loaded during simple hydrothermal method

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Abstract

The use of semiconducting metal oxides to develop highly sensitive CO_2 chemi-resistive sensing systems remains an important scientific challenge in the field of gas sensing. In this work, we describe the synthesis, characterization, and application of a very important CO_2 gas sensing material ZnO-loaded with different atomic percentages of La prepared by a simple hydrothermal method. Synthesized samples were structurally and thermally characterized. The CO_2 sensing characteristics of pure ZnO and La-loaded ZnO were compared using a homemade gas sensing measurement system. The sensitivity, operating temperature, and response/recovery time were systematically investigated based on the change in electrical resistance of the materials in the presence of CO_2. Experimental results confirmed that 50 at% La-loaded ZnO showed a maximum response to 5,000 ppm CO_2 (65%) at an operating temperature of 400 °C. The sensing mechanism of the pure and La-loaded ZnO nanopowders is discussed in detail. We believed that the La-loaded, flower-like ZnO nanopowder offers a potential platform for semiconductor-oxide-based CO_2 gas sensors.

Keywords: CO_2 gas sensor, porous La-loaded ZnO, hydrothermal method, p-n type electrical behavior.