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Influence of CuO nanostructures morphology on hydrogen gas sensing performances

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Abstract

In this study, the impact of different morphologies of p-type copper oxide nanostructures on hydrogen gas response is investigated. Sensor structures based on CuO nanowire (NW) networks demonstrated much higher gas response (~ 340) than nanostructured films (~ 3) at operating temperatures of 300 °C. Such a high gas response in the case of CuO NW networks is explained by percolating phase transition of CuO NW surface to metallic Cu. The phenomenon is observed at operating temperatures higher than 275 °C, but show good reversibility at 300 °C. At a higher operating temperature of 400 °C, the gas response was found lower (~ 108) than at 300 °C, even if the response time and percolating time were much shorter. On the other hand, the faster recovery time (~ 2 s) to the initial value of electrical baseline was observed at an operating temperature of 300 °C. This latter temperature is found the best regime for stable and highly sensitive and selective detection of hydrogen with high repeatability for sensor structures based on CuO NW networks. These results will help to take full advantage of

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these functional nanomaterials in the new generation of sensorial nanodevices for their larger scale utilization.