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Effective Parameter of Nano-CuO Coating on CO Gas-Sensing Performance and Heat Transfer Efficiency
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Abstract
The high gas-sensing performance of semiconductors is mainly due to the high surface-to-volume ratio because it permits a large exposed surface area for gas detection. This paper presents an evaluation study for the effects of nano-CuO coating parameters on the CO gas-sensing performance. The effects on gas-sensing performance and heat transfer efficiency of CuO coating were evaluated by investigating the effects of coating parameters (concentration, temperature, and solution speed) on thickness, grain size, and porosity. The CuO nanoparticle coatings were synthesized using the oxidation method at various operating conditions. Coating characteristics were investigated using X-ray diffraction, energy dispersive X-ray Spectroscopy, field emission scanning electron microscopy, and electrical resistivity meter. The average coating thickness, grain size, and porosity were around 13 µm, 48 nm, and 30%, respectively. The thermal transfer and gas-sensing properties of CuO coating were evaluated according to the total surface area of the coating formed at various operating conditions. The gas-sensing and thermal transfer performance were obtained from the optimization of coating parameters based on the coating morphology to achieve the highest contact surface area. The coating's surface area was increased by 350 times, which improved the heat transfer efficiency of 96.5%. The result shows that the coating thickness increased with the increase in solution concentration and decrease the temperature. The results also show that the sensitivity of the coating for CO gas was increased by 50% due to the reduction of coatings grain size.

Author Keywords
CO gas sensitivity; Coating parameters; Heat transfer; Nano-CuO coating
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