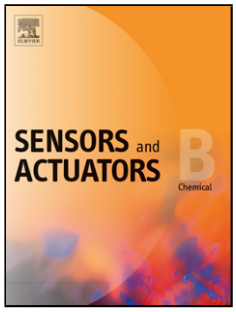

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Efficient hydrogen sensor based on Ni-doped ZnO nanostructures by RF sputtering

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Abstract

We demonstrate RF sputtered Ni-doped ZnO nanostructures for detection of extremely low concentration (1ppm) of hydrogen gas at moderate operating temperature of 75°C. Structural, morphological, electrical and hydrogen sensing behavior of the Ni-doped ZnO nanostructures strongly depends on doping concentration. Ni doping exceptionally enhances the sensing response and reduces the operating temperature of the sensor as compared to undoped ZnO. The major role of the Ni-doping is to create more active sites for chemisorbed oxygen on the surface of sensor and, correspondingly, to improve the sensing response. The 4 at% of Ni-doped ZnO exhibits the highest response (~69%) for 1% H_2 at 150°C, which are ~1.5 times higher than for the undoped ZnO. This is ascribed to lowest activation energy~6.47KJ/mol. Diminishing of the relative response was observed in 6% Ni- doped ZnO due to separation of NiO phase.

Graphical abstract