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Sensing characteristics of tin-doped ZnO thin films as NO_2 gas sensor

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Abstract

NO2 gas sensor was fabricated by successive ionic layer adsorption and reaction (SILAR) technique and rapid photothermal processing (RPP) of the Sn-doped ZnO film. The experimental results shows that tin doping of zinc oxide thin films improve the sensor element sensitivity to 1.5 ppm NO2 in air and downshift the operating temperature. The influence of variation of Sn concentration in the chemical bath and the RPP temperature on NO2 sensitivity of thin film sensor elements was investigated in this work. Higher sensitivity was obtained at 5–10 at.% tin concentration in the solution of ions and RPP temperature of 550–650 °C. Increasing the Sn concentration in doped ZnO samples more than 10 at.% as well as decreasing the oxygen partial pressure leads to the NO2 gas sensitivity decrease. It looks promising to use the inexpensive tin-doped zinc oxide thin films obtained by SILAR method and RPP in smart gas sensing devices that are able to recognize gas species in low concentrations and are demanded for continuous environmental monitoring.