

Undoped and Zn-doped NiO nanosheet/nanoflower-like films-based humidity sensor fabricated via immersion method

ABSTRACT

The nickel oxide (NiO) nanosheet/nanoflower-like (NS/NF) films-based humidity sensors doped with zinc (Zn) and without doping were successfully deposited on the NiO seed layer-coated glass substrates using the immersion method. The addition of 1 atomic percent of Zn concentration into pristine NiO has a significant influence on the structural and morphological properties as well as humidity sensing performance as there are changes in its crystal parameters. The Zn doping increased the dislocation density and tensile strain but shrank the average crystallite size (D) of NiO. The average D was estimated from three X-ray diffraction peaks of undoped and Zn-doped NiO NS/NF films, and the calculated values are 16.3 and 12.3 nm, respectively. The NiO surface morphology and the thickness are also affected by the Zn doping. The nanoflower (NF) shape and pattern on the nanosheet (NS) layer disappeared and dispersed obviously. Meanwhile, the NS thickness sharply decreased from 910 to 410 nm. By using silver contact as a sensing measurement electrode, the sensitivity of the Zn-doped NiO-based humidity sensor is increased to 78 compared to undoped NiO with a sensitivity of 30.