

Influence of annealing temperature on the sensitivity of nickel oxide nanosheet films in humidity sensing applications

ABSTRACT

Nickel oxide (NiO) nanosheet films were successfully grown onto NiO seed-coated glass substrates at different annealing temperatures for humidity sensing applications. NiO seed layers and NiO nanosheet films were prepared using a sol-gel spin coating and sonicated sol-gel immersion techniques, respectively. The properties of NiO nanosheet films at as-deposited, 300 °C, and 500 °C-annealed were examined by X-ray diffraction (XRD), field emission scanning electron microscopy (FESEM), ultraviolet-visible (UV-vis) spectroscopy, and humidity sensor measurement system. The XRD patterns demonstrate that the grown NiO films have crystalline cubic structures at temperature of 300 °C and 500 °C. The FESEM images show that the large porous nanosheet network spread over the layers as the annealing temperature increased. The UV-vis spectra revealed that all the nanosheet films have the average transmittance below than 50% in the visible region, with absorption edges \sim 350 nm. The optical band gap energy was evaluated in ranges of 3.39 to 3.61 eV. From the obtained humidity sensing results, it shows that 500 °C-annealed film exhibited the best sensitivity of 257, as well as the slowest response time, and the fastest recovery time compared with others.