Non-aqueous synthesis of hexagonal ZnO nanopyramids: Gas sensing properties

Abstract

Zinc oxide (ZnO) nanopyramids were synthesized by a one-pot route in a non-aqueous and surfactant-free environment. The synthesized metal oxide was characterized using SEM, XRD, and TEM to investigate the surface morphology and crystallographic phase of the nanostructures. It was observed that the ZnO nanopyramids were of uniform size and symmetrical, with a hexagonal base and height of ~100 nm. Gas sensing characterization of the ZnO nanopyramids when deposited as thin-film onto conductometric transducers were performed towards NOx and C2H5OH vapor of different concentrations over a temperature range of 22-350 °C. It was observed that the sensors responded towards NO2 (10 ppm) and C2H 5OH (250 ppm) analytes best at temperatures of 200 and 260 °C with a sensor response of 14.5 and 5.72, respectively. The sensors showed satisfactory sensitivity, repeatability as well as fast response and recovery towards both the oxidizing and the reducing analyte. The good performance was attributed to the low amount of organic impurities, large surface-to-volume ratio and high crystallinity of the solvothermally synthesized ZnO nanopyramids.