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Abstract

Ammonia is one of the most hazardous substance and highly toxic to human health when inhaled above the moderate level. Sensing ammonia is one most challenging task at low temperature level and room temperature. ZnO and Al-doped ZnO nanostructures were successfully synthesized by sol–gel method, and their structural, optical, morphological, and gas sensing properties were investigated. Field-emission scanning electron microscopy revealed that the ZnO nanorods transformed into particles upon incorporation of Al. Transmission electron microscopy and high-resolution transmission electron microscopy confirmed that both the ZnO nanorods and Al-doped ZnO nanoparticles were crystalline. Fourier transform infrared spectroscopy analysis indicated the presence of Zn–O and Al–O in the nanostructures. Energy-dispersive X-ray spectroscopy revealed the presence of Al in the Al-doped ZnO materials. The ammonia gas sensing analysis revealed that the Al-doped ZnO nanoparticles displayed a higher response than the ZnO nanorods. Moreover, among the doped samples, that