

Highly sensitive ZnO:Al thin film NO_x sensors with a template of single-walled carbon nanotubes

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Gas sensors based on ZnO make use of chemical sensitivity of the surface to different adsorbed gases, which cause change in resistance of the sensor. CNT(Carbon Nano Tube) have been reported to have many applications and act as sensing materials, among others, in which their small size and large active surface areas.

ZnO is used in various forms for detection of H₂, C₂H₅OH, NH₃ and NO_x etc. the NO gas sensing properties of ZnO-carbon nanotube (ZnO:Al-CNT) composites fabricated by the coaxial coating of single-walled CNTs with ZnO:Al using RF Magnetic sputter system. Upon examination, the morphology and crystallinity of the ZnO-CNT composites showed that CNTs were uniformly coated with polycrystalline ZnO with a grain size as small as 40nm. Gas sensing measurements clearly indicated a remarkable enhancement of the sensitivity of ZnO-CNT composites for NO gas compared to that of ZnO films while maintaining the strong sensing stability of the composites, properties the CNT-based sensing materials do not have.

The enhanced gas sensing properties of the ZnO-CNT composites are attributed to an increase in the surface adsorption area of the ZnO layer via the coating by CNTs of a high surface-to-volume ratio structure. These results suggest that the ZnO-CNT composites is a promising template for novel solid-state semiconduction gas sensors.