

SWNTS AND SnO₂ COMPOSITE AS A HIGH PERFORMANCE AMMONIA GAS SENSOR

*Nguyen Duc Hoa, Nguyen Van Quy, Yousuk Cho, Dojin Kim**

*School of Nano Science and Technology, Chungnam National University, Daejeon, Korea
dojin@cnu.ac.kr*

A new ammonia gas sensor structure of single-walled carbon nanotubes (SWNTs) and SnO₂ composite was developed. Thin Sn layer of ~100 nm thickness was deposited on SiO₂/Si substrate followed by in-situ SWNTs deposition in an arc-discharge chamber. SWNTs/SnO₂ nanocomposite was formed by annealing of the substrate at 500 °C in N₂ and following oxidation at 450 °C in air. Interdigitated device structure was patterned with Pt/Ti electrodes. The SWNT quality was examined by Raman spectra, field emission scanning electron microscopy, and transmission electron microscopy. The electrical and gas sensing properties of the device were investigated. The nanocomposite revealed a semiconducting property, or decreasing electrical resistance with temperature. It showed a non-linear I-V curve due to tunneling between the semiconducting SWNTs. The electrical resistance of the nanocomposite sensor rapidly increased with exposure to ammonia gas. The sensor could detect an extremely low concentration of NH₃ down to ppb level at room temperature. The sensitivity of the composite gas sensor increased linearly with NH₃ concentration. The sensor also exhibited a very fast response of less than 100 seconds with reproducible sensing and recovery cycles. The recovery time was a few minutes.

Keywords: Single-walled carbon nanotubes, SnO₂, nanocomposite, ammonia gas sensor

*Corresponding author: dojin@cnu.ac.kr