

H₂ sensing performance of optical fiber coated with nano-platelet WO₃ film

ABSTRACT

For the first time, we have integrated nano-platelet Pd/WO₃ films, which are formed using an acid etching method, with optical fibers to develop a hydrogen gas (H₂) sensors. The tungsten films were firstly RF sputtered on top of optical fiber tips, and subsequently etched in 1.5 M nitric acid to produce tungstite films. After annealing at 300 and 480 °C, these films were coated with approximately 25 Å thick Pd layers. The films were characterized using SEM, GADDS, EDX, and both Raman and UV-vis-NIR spectroscopy. H₂ testing measurements were conducted when the sensors were interacting with 0.0661% H₂ in synthetic air at an optimum temperature of 100 °C. It was found that the highly crystalline nano-platelet Pd/WO₃ film based optical fiber H₂ sensors show large reflectance responses in the NIR wavelength of 6% and 12% in the presence of 0.06% and 1% H₂, respectively.

Keyword: Optical fiber sensor; Tungsten trioxide; Nanostructure; H₂