Single-mode fiber coated with zinc oxide (ZnO) nanorods for H2 gas sensor applications

ABSTRACT

A Hydrogen (H2) gas sensor was successfully developed using optical fiber coated with Zinc Oxide (ZnO) nanorods. The single-mode fiber (SMF) used as a sensing device has been prepared by etching the SMF fiber and coated with ZnO nanorods. The etching of the fiber was performed using hydrofluoric acid (HF) to enhance the evanescent field around the fiber core. The ZnO nanorods were prepared by hydrothermal method through seeding and growth solution technique. The diameter of cladding and core are 125 μm and 8 μm, respectively, before etching and goes down to 11μm after etching. Around 2 cm of ZnO nanorods were coated in the middle of the etched fiber. The sensing layer was characterized through Scanning Electron Microscopy (SEM), Energy Dispersive X-Ray (EDX) and X-Ray Diffraction (XRD) to verify the properties of ZnO. The developed sensor's response and recovery time were observed to be 7 min and 3 min, respectively, for a low concentration of 0.25% H2 gas. The aim of this study is to understand the gas sensing properties towards the spectral intensity variations in etched optical fiber coated with ZnO nanorods.

Keyword: Hydrogen sensor; Fiber-optic sensor; ZnO nanorods; Hydrothermal method