Modified plastic optical fiber with CNT and graphene oxide nanostructured coatings for ethanol liquid sensing

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Abstract

A high sensitivity and simple ethanol sensor based on an un-cladded multimode plastic optical fiber (UCPOF) coated withcarbon nanotubes (CNTs) for the detection of different concentrations of ethanol in de-ionized water is developed and demonstrated. The UCPOF probe is fabricated by chemically removing the fiber cladding and integrated with CNT as a sensing layer. The effect of surface morphology on the sensor performance is investigated by characterizing another UCPOF coated with GO nanomaterial. The developed fibers are coated with CNTs and GO using drop casting technique. Energy dispersive X-ray spectroscopy (EDX), atomic-force microscopy (AFM) and scanning electron microscope (SEM) are used to investigate the element and morphology of the synthesized nanomaterials. The experimental results indicated that the absorbance spectrum of the CNT-based UCPOF sensor increases linearly with a higher sensitivity of 0.68/vol% and magnitude change of 95.4% as compared to 0.19/vol% and 56.3%, respectively, for the GO-based sensor. The UCPOF coated with CNTexhibits faster response and recovery than that of GO. The sensor shows high selectivity to ethanol amongst a range of diluted organic VOCs. The superior sensing performance of the developed fiber sensor indicates its high efficiency for ethanoldetection in various industrial applications. © 2017 Optical Society of America.

DOI: 10.1364/OE.25.005509