DOI 10.5162/IMCS2018/P2NG.11

Kamal Arora[1] and Nitin K. Puri[1]*
[1] Advanced Sensor Laboratory, Department of Applied Physics, Delhi Technological University, Bawana road, Delhi 110042, India

**Corresponding author's email address: nitinkumarpuri@dtu.ac.in*

Abstract

Key words: Palladium oxide, Polyaniline, Hydrogen, Conductometric sensor, room temperature

PdO/Polyaniline nanocomposite for room temperature hydrogen sensing application

This work reports the synthesis of palladium oxide (PdO)/polyaniline nanocomposites with their application as highly sensitive, stable and selective hydrogen gas sensing materials. Pristine polyaniline is synthesized using economical and facile chemical synthetic route and it is loaded with different weight percentage (1 wt%, 2 wt%, 5 wt% and 10 wt%) of PdO via simple sol-gel process. The crystallographic properties, shape and size of synthesized polyaniline and its nanocomposites are characterized using X-ray diffraction (XRD) spectroscopy and transmission electron microscopy (TEM) correspondingly, whereas their nature of bond and optical properties are obtained using Fourier transform infrared (FTIR) spectroscopy and ultraviolet-visible (UV-Vis) absorption spectroscopy respectively. Uniform thin film of polyaniline and PdO/Polyaniline nanocomposites is fabricated using spin coating process on platinum interdigitated glass substrates and their surface morphology along with their uniformity is observed using scanning electron microscopy (SEM). Polyaniline and PdO/polyaniline nanocomposite thin films are employed as active materials for conductometric solid state hydrogen gas sensing application at room temperature. It is found that PdO/polyaniline nanocomposites thin film shows high hydrogen gas sensitivity as compared to the pristine polyaniline and their sensing response increases as the concentration of PdO rises from 1 wt% to 10 wt%. Also, it is observed that PdO/polyaniline nanocomposite thin film shows higher selectivity for hydrogen (H_2) on being compared with the sensitivity for carbon dioxide (CO_2), Sulphur dioxide (SO_2) and Methane (CH_4) respectively. These observations will assist in the fabrication of miniaturized highly selective and stable solid state room temperature hydrogen gas sensors.

References

1) Fratoddi, Ilaria, Iole Venditti, Cesare Cametti, and Maria Vittoria Russo. "Chemiresistive polyaniline-based gas sensors: A mini review." Sensors and Actuators B: Chemical 220 (2015): 534-548.

2) Josowicz, Mira, Hong Shi Li, Karel Domansky, and Donald R. Baer. "Effect of oxidation state of palladium in polyaniline layers on sensitivity to hydrogen." Electroanalysis 11, no. 10-11 (1999): 774-781.

3) Hien, Hoang Thi, Ho Truong Giang, Nguyen Van Hieu, Tran Trung, and Chu Van Tuan. "Elaboration of Pd-nanoparticle decorated polyaniline films for room temperature NH3 gas sensors." Sensors and Actuators B: Chemical 249 (2017): 348-356.