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Room temperature VOCs sensor based on microwave-intensive pulsed light treated TiO_2-SnO_2/CNTs hybrid nanocomposite

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SnO_2 and TiO_2 were loaded onto multi-walled carbon nanotubes (MWCNTs) to form a new composite for the sensing of volatile organic compounds (VOCs). To do this, MWCNTs were dispersed into mixtures of 0.5 wt.% SnO_2/TiO_2. The TiO_2 was converted from anatase to rutile phase through the use of rapid microwave and intense pulsed light techniques. These processes are also used for drying to obtain the materials as a dry powder. The materials were then incorporated into a solution of 5 wt.% polyvinyl butyral (PVB) to form a sol-gel. A gas sensing device was formed by spin coating the materials onto quartz crystal microbalance (QCM). FE-SEM and XRD characterizations indicated that the inclusion of CNTs did not affect the particle size or the morphology of the thin film. Most importantly, the sensor based on the SnO_2-TiO_2-MWCNT hybrid showed the high and fast response, high selectivity to VOCs relative to hydrogen gas and good stability. Mass and molar adsorption was calculated based on changes in the frequency by the Sauerbrey model. The sensing properties were investigated with different VOCs including ethanol, methanol, isopropanol, and toluene at different concentrations and operating temperatures. Room temperature sensing was achieved and the highest sensitivity was shown towards ethanol with a response time as low as 5 seconds.

Biography

Sherif Mostafa is a postdoctoral fellow at the University of Calgary. He works as a Manager of an analytical chemistry laboratory. He has MSc degree in 2005 in chemical engineering with Thesis Title " Fiber Treatment for Reduction of Radar Signature ".Also, he has Ph.D. degree in 2014 in chemical engineering with thesis title " Creation of Advanced Ceramic Materials in Nanotechnology Range". He has experience in nanoceramic materials synthesis, water treatment, decontamination, antibacterial materials, RAM and preparation of gas sensing materials. Sherif participates in many types of research in different fields. He supervised many types of research in various fields.

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