Hydrogen and UV Band Detectors Based on ZnO Coated with Divinylbenzene

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Abstract. A zinc oxide-based UV detector and gas sensing structure has been made. Via iCVD, a thin film layer of divinylbenzene (DVB) has been coated atop ZnO. iCVD being a technology of interest, was chosen for coating as it offers good control over polymer film thickness and maintains the specific topography of the substrate. Thus, a DVB layer with thickness of about 25 nm has been obtained. This hydrophobic layer offers enhanced gas sensing properties at different relative humidity, as well as possibilities to tune selectivity and sensitivity of detectors. Optical and gas sensing properties have been studied in details. Furthermore, to better asses relative humidity influence on hydrogen gas sensing, measurements have been made at relative humidity of 10% and 40% RH. Obtained results shows that DVB@ZnO hybrid structure responds to UV radiation at room temperature up to 9000% from the baseline, and decreasing in value with increase of the operating temperature (from room temperature up to 350 °C), yet maintaining a nearly the same reaction time. In case of H_2 sensing it shows best gas responses at 300 °C with response values of 65% for 10% RH, and 85% at 40% RH, respectively. Hydrogen gas detection is important as it acts as a biomarker for certain diseases in medical applications, while UV radiation detection offers feedback for crops protection, cosmetics sun creams efficiency and even medicine where UV is used in phototherapy, photodynamic therapy and for drug release. This novel sensor further prospects two-in-one hybrid sensors niche as both hydrogen and UV band detector.

Keywords: ZincOxide · Divinylbenzene · Nanosensor · Selectivity · Hydrogen

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