

Highly Sensitive Nanostructured Chromium Oxide Sensor for Analysis of Diabetic Patient's Breath

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Abstract : Diabetes mellitus is a serious illness and can be life-threatening if left untreated. Acetone present in the exhaled breath of a diabetic person is a biomarker of patients suffering from diabetes mellitus and is higher than its usual concentration present in the breath of healthy people. In the present work, a portable gas sensor system based on chromium oxide (Cr_2O_3) nanoparticles has been developed that can analyze diabetic patient's breath. Undoped and indium (In) doped Cr_2O_3 nanoparticles were synthesized by a chemical route and characterized by X-ray diffraction, scanning electron microscopy, Raman spectroscopy, UV-visible spectroscopy, and photoluminescence spectroscopy for their structural, morphological and optical properties. Thick film gas sensors were fabricated out of synthesized samples. To diagnose diabetes, the sensors' response to low concentrations of acetone was measured, and it was found that the addition of indium dramatically enhances the acetone gas sensing response. Moreover, the fabricated sensors were highly stable, reproducible and resistant to humidity. Enhancement of sensor response of doped sensors towards acetone can be ascribed to increase in defects due to addition of a dopant, and it was found that in-doped Cr_2O_3 sensors are more useful for analysis of breath of diabetic patients.

Keywords : Diabetes mellitus, nanoparticles, raman spectroscopy, sensor

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