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Effect of Ruthenium dopant on the sensitivity of alpha iron oxide (α-Fe2O3) to Flammable and Hazardous Gases

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The increase in the number of manufacturing industries in the recent time has both positive and negative impact on our environment and the human health. The use of heavy duty machines in manufacturing industries causes the release of flammable and hazardous gases, which affect the human health, into the atmosphere. A lot of research efforts have been focused on the detection and monitoring of these gases using metal oxide semiconductor materials. This study investigates the gas sensing performance of Ruthenium-doped alpha iron oxide towards the flammable and hazardous gases. The alpha iron oxide doped with different weight percentage of Ruthenium were synthesized by co-precipitation method. The samples underwent some characterization techniques, such as X-ray diffractometry, thermogravimetric analysis, x-ray photoelectron spectroscopy, Brunauer-Emmett-Teller surface area analysis, scanning electron microscopy, and high resolution transmission electron microscopy, to study certain properties of the material. The sensors were fabricated by using the drop-casting method, and the sensors were tested for gas sensing performance, at 225 ^{0}C operating temperature, toward LPG, Ethanol, Propanol, Ammonium (NH3) and H2S. The pure sample (α-Fe2O3) was more sensitivity to the target gases with the response being 24.41 toward LPG, while the response decreased upon addition of ruthenium to alpha iron oxide. Ruthenium was found to be unsuitable as dopant material in alpha iron oxide for gas sensing application.
Keywords: Gas sensing, Dopant concentration, Alpha-Fe2O3-based sensor, Sensitivity, Flammable gases.

Apply to be considered for a student ; award (Yes / No)?

yes

Level for award;(Hons, MSc, PhD, N/A)?

PhD

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