

Oral Presentations

Synthesis and characterization of metal-doped humidity sensors based on hematite for environmental monitoring applications

Ahmed S. Afify¹, Amr Mohammed², M. Ataalla³, Azhar Hussain¹, M. Hassan¹, M. Milanova³, J.M. Tulliani¹

¹*Politecnico di Torino, Italy*

²*Chemistry Department, Taibah University, Saudi Arabia*

³*UCTM, Sofia, Bulgaria*

Ahmed.afify@polito.it

Abstract

Humidity sensors have several applications in both industrial processing and environmental control. Pure and doped hematite have proved to exhibit a remarkable humidity sensing properties. The aim of this investigation is to study the effect of doping of some metal ions (Li^+ , Mg^{+2} , Ba^{+2} , Sr^{+2} , and Na^+) onto the crystalline hematite and to determine their sensitivity towards relative humidity (RH). The obtained crystalline samples were characterized by particle size distribution, X-Ray Diffraction (XRD) combined with Field Emission Scanning Electron Microscopy (FESEM).

Sensors were screen printed onto an α - alumina substrates with platinum electrode followed by Screen printing of doped $\alpha\text{-Fe}_2\text{O}_3$ powders and a binder for the appropriate rheological properties to the paste. After deposition samples were dried in air at room temperature prior to be heat treated at 800°C for 1h. Humidity sensors were tested in a laboratory apparatus made of a thermostated chamber, operated at 25°C, in which relative humidity (RH) could be varied between 0 and 96%.

The doped sodium metal ions (Na^+) hematite sample showed a significant response towards relative humidity at room temperature.