

Barium strontium titanate humidity sensor: impact of doping on the structural and electrical properties

ABSTRACT

The influence of Mg²⁺ doping (3 mol %) on structural and humidity sensing properties of (Ba_{0.5},Sr_{0.5})TiO₃ (BST) perovskite nanocomposite were studied in details. Microstructural properties revealed the particle size, surface area, and average pore volume diminished for doped sample. For the MgO doped BST sensor, the film resistance and total impedance are changed more than four orders of magnitude in the 20–95% RH range, while BST sensor shows three orders change. The 3 mol % MgO doped sample with maximum hysteresis of 6.1 RH% and response/recovery time of about 30/80 s exhibits faster characteristics compare to pure BST sample with 6.8 RH% hysteresis and response/recovery of 41 s and 98 s, respectively. Transduction mechanism was found based on the proton transfer and further confirmed by a Bode plot and Nyquist complex impedance plane plot.

Keyword: Humidity sensor; Perovskite nanocomposite; MgO; Strontium titanate; Proton transfer