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**Observation of Enhanced Humidity Sensing Performance and Structure, Dielectric, Optical and DC Conductivity Studies of Scandium Doped Cobalt Chromate**

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**Abstract**

In the present investigation, we have examined the evolution and influence of Sc3+ content on the structural, microstructural, UV–Visible, Dielectric, DC conductivity and humidity sensing performance of Cobalt chromate viz., Co(1−x)ScxCr2O4 nanoparticle are synthesized by modified solution combustion method using mixture of carbamide and glucose as fuel. For sintered powder to study the Crystallinity, phase purity, Structure analysis are done by using X-ray diffractogram (XRD). The results of the XRD analysis give rise to all the samples are exhibit single phase with spinel cubic structure. Further the crystallite size was observed in nano region. The increase of the lattice parameter provides evidence for the effective substitution of Sc3+ at A site. The surface morphology, microstructure and elemental analysis are done by using SEM and EDS respectively. The SEM micrographs reveals that material are exhibits highly porous nature and producing agglomeration. The results of EDS confirms perfect elemental composition and there is no impurities in the samples. Particle size of both samples were estimated from particle size distribution diagram. The UV–Vis diffuse reflectance analysis were used to estimate the band gap of the samples. To understand the electrical behaviour of the samples we have done dielectric properties as a function of frequency. Dielectric measurements reveal that dielectric constant is loos tangent decreases with increasing frequency and it is constant for higher frequency side, this can be discussed using Koop’s theory. For estimate the activation energy DC conductivity measurements used. The specific surface range (SSA) are analyzed by using Brunauer–Emmett–Teller (BET) measurement and were found 165 Cm3/g STP and 40,790 Cm3/g STP. Further the average pore diameters were found 38 and 28 nm. To explore the response of the material at different humidity levels humidity sensing measurements carried out and humidity sensing response coefficient is estimated. From this study the fundamental behaviour of the synthesized materials at different standards were evaluated for various industrial applications.

**Keywords:**

Ceramics, Phase transitions, Nuclear magnetic resonance (NMR), Raman spectroscopy, Dielectrics

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