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**Exploring the Structural, Dielectric and Magnetic Properties of 5 Mol% Bi3+-Substituted CoCr2O4 Nanoparticles**

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**Abstract**

In the present work for the first time, we report in-depth structural, electrical, optical and magnetic properties of a family of cobalt chromate nanoparticles with 5 mol% Bi3+ substitution of the average crystallite size of 15 nm, fabricated by a solution combustion method using urea and glucose as a fuel. Co0.95Bi0.05Cr2O4 shows a single phase with spinel cubic structure with a space group of Fd3m with a lattice parameter of 8.334 Å. The morphology of the family of Bi3+-doped CoCr2O4 shows a highly porous nature. Transmission electron microscopy (TEM) shows samples are in nano size, i.e. 22 nm with well crystalline nature. The energy gap was estimated by using UV spectrum and found in the range of 3.86 eV. Temperature-dependent dielectric constant (ε′), dielectric loss (ε″) and loss tangent (tan δ) are explained by using Maxwell–Wagner and Koop’s phenomenological theory. The evolution of magnetic behaviour was studied as a function of temperature and magnetic field to study the magnetic transitions such as paramagnetic to long-range collinear ferrimagnetism transitions, and it was found at 98 K and non-collinear ferrimagnetism at 26 K. M−H loop at 300 K nearly shows a paramagnetic phase at 98 K and it clearly suggests that samples exhibit super paramagnetic nature.

**Keywords:**

Chromates, Solution combustion method, Ferrimagnetism, Koop’s ophenomenological theory

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