

# Magnetic and Magnetodielectric Properties of Holmium Doped BaTiO<sub>3</sub>-CoFe<sub>2</sub>O<sub>4</sub> Multiferroic Composite

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**Abstract**—This study reports some physical properties of  $(1-x)$  BaY<sub>0.05</sub>Ti<sub>0.925</sub>O<sub>3</sub>  $-x$  CoY<sub>0.1</sub>Fe<sub>1.9</sub>O<sub>4</sub> ( $x=0.05, 0.10$  and  $0.15$ ) multiferroic composite. The proposed composite was synthesized through solid state reaction method in which yttrium barium titanate was processed through solid state reaction method and yttrium doped cobalt ferrite through the sol-gel process. Microstructural analysis revealed monophasic grains for yttrium barium titanate phase, however, a loosely packed biphasic structure was observed for composite. Measurement of the magnetic hysteresis loops at room temperature indicates that the magnetic parameters of the composite are diluted by the presence of the ferroelectric phase. However at low temperature of about  $-150^{\circ}\text{C}$ , the coercivity was enhanced to a greater extent. The symmetrical ferroelectric hysteresis loops for composite established the ferroelectric nature. Improved dielectric properties and low dielectric losses have been observed due to yttrium doping in the composite. The diffuseness of the ferroelectric transitions for the composite was confirmed by Curie-Weiss law. The magnetodielectric studies confirmed that the overall magnetocapacitance in the composite is the combined effects of magnetoresistance and magnetoelectric coupling.

**Keywords:** Multiferroics, Phase transition, Hopping mechanism, Magnetodielectric.