

**UGC Sponsored Minor Research Project entitled**  
**“Synthesis and Characterization of Multiferroic Rare Earth based Perovskite**  
**Structures for Applications in Memory Devices”**

**Sivaraj.K.S**

Department of Physics, Aquinas College, Edacochin, 682010  
Department of Physics, Cochin University of Science and Technology, 682022

**Abstract**

Multiferroic materials are a new class of materials which are extensively researched due to their novel multifunctional properties. These materials are those in which two or all three of the properties: ferroelectricity, ferromagnetism and ferroelasticity occur in the same phase. In particular the focus is on the Multiferroicmagnetoelctrics-materials that are simultaneously ferromagnetic and ferroelectric with or without ferroelasticity. They exhibit spontaneous magnetic polarization that may be switched on/off with electric field and spontaneous electric polarization that may be switched on/off with magnetic field. They find extensive applications in devices such as sensors, field effect transistors and memory devices. Rare Earth based multiferroics have attracted the attention of scientists and engineers because they satisfy some of the essential criterion for exhibiting multiferroicity namely non-centrosymmetry, d<sub>0</sub>-ness and geometric frustrations. YMnO<sub>3</sub> is one of the most extensively studied multiferroic, hexagonal manganite which shows ferroelectric transition at ~900K and antiferromagnetic transition at ~60K. The main objectives of this research work are as follows:

1.Synthesis of perovskite structured rare earth based compounds having the general formula RMnO<sub>3</sub> and RFeO<sub>3</sub> (R = La, Y, Tb) using solid state reactions and co-precipitation methods, both in the micro and nano regime.

2.Doping the prepared samples with Di-valent cations (Ca<sup>2+</sup>, Ba<sup>2+</sup> etc.) and subjecting to dielectric and magnetic characterization. Optimizing the doping composition to enhance the multiferroicity.