Room Temperature Ferroelectricity and Magnetoelectric Coupling in $Sr_3Co_2Fe_{24}O_{41}$ Hexaferrite

Anurag Gaur*, Pawan Kumar
Department of Physics, National Institute of Technology
Kurukshetra-136119, Haryana, India
*Anurag Gaur: anuragdph@gmail.com

Multiferroics, which represent a class of materials having simultaneous dual property response such as ferromagnetism and ferroelectricity, are under intense investigation at the present time in view of their many projected novel applications and new physics they have to offer. Single-phase multiferroic materials are defined as homogenous compounds and chemically isotropic, in which electric and magnetic order states coexist at any point or given location within the material. Single phase materials either show the magnetoelectric effect at low temperatures or if the temperature is high the coupling constant is very low. Recently, some hexaferrites (Y, Z, W and M) were found to exhibit the magnetoelectric effect at high temperatures.

In this work, we have tried to study the ferroelectric and magneto-electric behavior of $Sr_3Co_2Fe_{24}O_{41}$ hexaferrite at room temperature. The Z type strontium $Sr_3Co_2Fe_{24}O_{41}$ hexaferrite was synthesis by the sol-gel auto combustion method. The pure phase of synthesized sample was identified by the X-ray diffraction (XRD). Ferroelectric behaviour of the sample was observed between the applied electric voltages, from 5 to 30 KV through Polarization verses Electrical (P-E) loop tracer. The maximum polarization (Ps) 0.45 $\mu C/cm^2$ was obtained at 30 KV field. The M–H curve shows the soft ferrite nature of prepare $Sr_3Co_2Fe_{24}O_{41}$ hexaferrite at room temperature, which has the maximum saturation value 35 emu/g at 4500 gauss magnetic field. The average value of magneto-electric coupling coefficient for $Sr_3Co_2Fe_{24}O_{41}$ hexaferrite is observed ~3.88 mv/cm Oe at room temperature. The observation of room temperature magneto-electric coupling in this compound provides the basis for creating new varieties of multiferroic devices.