

# Seminar

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## Institute for Plasma Research

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**Title:** Unravelling the Nature of Magneto-electric Coupling in Room Temperature Multiferroic Particulate ( $\text{PbFe}_{0.5}\text{Nb}_{0.5}\text{O}_3$ ) – ( $\text{Co}_{0.6}\text{Zn}_{0.4}\text{Fe}_{1.7}\text{Mn}_{0.3}\text{O}_4$ ) Composites

**Speaker:** Dr. Krishnamayee Bhoi  
Department of Physics & Astronomy, NIT Rourkela

**Date:** 17<sup>th</sup> May 2024 (Friday)

**Time:** 3.30 PM

**Venue:** Seminar Hall, IPR

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### Abstract:

Magneto-electric multiferroic materials have received significant attention of scientific community due to the interesting fundamental physics as well as wide range of multifunctional device applications in multiple state memory elements, sensors etc. Hence, the 3-0 type particulate multiferroic composites having general formula  $(1-\Phi)[\text{PbFe}_{0.5}\text{Nb}_{0.5}\text{O}_3]-\Phi[\text{Co}_{0.6}\text{Zn}_{0.4}\text{Fe}_{1.7}\text{Mn}_{0.3}\text{O}_4]$  ( $\Phi = 0.0, 0.1, 0.2, 0.3, 0.4, 0.5, 1.0$ ,  $(1-\Phi)$  PFN- $\Phi$ CZFM0) were prepared using a hybrid synthesis technique. The objectives of the proposed work, synthesis technique used, different methodology adopted for characterizations followed by their results and discussion will be presented during the seminar.

Preliminary structural and microstructural analysis were carried out using XRD and FESEM techniques, which suggest the formation of 3-0 type particulate composite without the presence of any impurity phases. The multiferroic behaviour of the composites is studied with polarization versus electric field (P-E) and magnetization versus magnetic field (M-H) characteristics at room temperature. The nature of ME coupling was investigated elaborately by employing the Landau free energy equation along with the magneto-capacitance measurement. This investigation suggests the existence of biquadratic nature of ME coupling ( $P^2M^2$ ). The magneto-electric coupling measurement also suggests that strain mediated domain coupling between the ferroelectric and magnetic ordering is responsible for the magneto-electric behaviour. The obtained value of direct ME coefficient 26.78 mV/cm-Oe for  $\Phi = 0.3$ , found to be higher than the well-known single-phase materials and polycrystalline composites.