



KNOWLEDGE INCUBATION FOR TEQIP
IIT KANPUR

Visiting Researcher Program

March 26, 2017 to April 26, 2017

ABOUT

This was a one month visiting researcher program under which KIT hosted Ms. Nandini Sharma a PhD. Scholar from PEC University of Technology, Chandigarh. Ms. Sharma worked under Dr. Ashish Garg and Dr. Rajeev Gupta for a month on Synthesis and Characterization of $\text{GaFe}_{1-x}\text{Ti}_x\text{O}_3$ ($x=0.025, 0.05, 0.075, 0.10$) ceramics.

HOSTS

Dr. Ashish Garg

Professor

Materials Science and Engineering Department

Indian Institute of Technology-Kanpur

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Dr. Rajeev Gupta

Associate Professor

Department of Physics

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VISITING RESEARCHER

Ms. Nandni Sharma

PhD. Scholar

Applied Sciences Department

PEC University of Technology

Chandigarh

Work Done

Synthesis and Characterization of GaFe_{1-x}Ti_xO₃ (0 ≤ x ≤ 10) ceramics

We prepared the GaFe_{1-x}Ti_xO₃ (x= 0.025, 0.05, 0.075, 0.10) polycrystalline samples using solid state reaction method. Ga₂O₃, Fe₂O₃ and TiO₂ oxides were weight according to the stoichiometry and grind in agate mortar till the homogenous mixture was formed. The mixed powders were calcined at 1300°C for 4hrs. For electrical and magnetic measurements, the calcined powder was pelletized using polyvinyl alcohol (PVA) as a binder and pressed into cylindrical pellets with dimensions 7mm diameter and 1.5mm thickness, and sintered at 1350°C for 8hrs. XRD of Ti-doped GaFeO₃ samples were done for the structural analysis. The XRD data shows the orthorhombic structure with space group *Pc2₁n* and no signature of any impurity phase was found in Ti-doped GFO samples. Rietveld refinement of XRD data was done for the information of lattice parameters. The lattice constant and unit cell volume is increases with the Ti-doping in GaFeO₃. SEM micrograph of fractured pellet of Ti doped samples was done. Porosity is present in the doped samples and this is due to the Ti⁺⁴ doping. EDX pattern of GaFe_{0.90}Ti_{0.10}O₃ sample was done and it confirmed the chemical homogeneity of the sample. All samples exhibit dielectric dispersion over the entire frequency range from 10² Hz to 10⁷ Hz and become constant in the high frequency region. Also, dielectric loss for undoped and Ti doped GaFeO₃ samples was measured at room temperature. The value of dielectric loss for x=0.075, 0.10 samples are less as compared to pure GFO. Leakage current density measurements of Ti-doped GFO samples were done at room temperature. The plots remain symmetric upon application of positive and negative bias, indicating an Ohmic type contact on both electrodes. For x= 0.075 composition, we get the smaller value of leakage current as compared to other compositions.