Contribution ID: **198** Type: **Oral Presentation**

Structural and Magnetic Study of $NdCrTiO_5$ Nanoparticles

Thursday, 7 July 2022 15:15 (15 minutes)

In a search for superior magnetic materials with novel properties, including magnetization reversal, magnetocaloric effect, spin switching, spin reorientation and exchange bias effect, focus is on multiferroic materials [1-5]. Single phase multiferroic materials exhibits the coexistence of two or more of the ferroic orderings and can find application in memory devices [2]. $RCrTiO_5$ compounds shows interesting magnetic behavior because of the presence of two magnetic sublattices, R^{3+} and Cr^{3+} [1-2]. $NdCrTiO_5$ is one of the compounds from this group, but reports on the magnetoelectric properties of $NdCrTiO_5$ in the bulk form is limited [2-3]. Therefore, this contribution focuses the synthesis, structure, morphology and magnetic properties are discussed for nano $NdCrTiO_5$. The orthorhombic crystal structure with lattice parameters, a, b, c is 7.5715(7), 8.7270(9), 5.7917(8) Å, respectively, was confirmed through x-ray diffraction. The average particle size obtained from the transmission electron microscopy is 33 ± 1 nm, selected area diffraction pattern confirms the crystalline nature of the sample and energy dispersive x-ray spectroscopy confirms the elemental composition. From the temperature-dependent magnetization measurement on the nanoparticles the Néel temperature, T_N , could not be obtained. This is in contrast with the previously observed in bulk samples at 18 and 21 K [2, 3] and might be due to the nano size of the material. Further, the ferromagnetic nature of the material is observed from the magnetization as the function of field measurement with coercivity 0.018 ± 1, 0.019 ± 1 T and exchange bias 0.004 ± 1, 0.003 ± 1 T, at 2 and 10 K, respectively. The observed anomalous properties are discussed considering the size effect.

Keywords: Nanomaterials, $RCrTiO_5$, Magnetic sublattices and Exchange Bias.

References:
[1] Das et al.,J. Phys.: Condens. Matter. Vol. 32, p.035802 (2020).
[2] Hwang et al., Phys. Rev. B Vol. 85, p.024415 (2012).
[3] Saha et al., J Mag. Mag. Mat. Vol. 360, p.34 (2014).
[4] Bharati et al., J Mag. Mag. Mat. Vol. 564, p.168862 (2022).
[5] Bharati et al., AIP advances. Vol. 12, p.035245 (2022).

Apply to be considered for a student ; award (Yes / No)?

NO

Level for award;(Hons, MSc, PhD, N/A)?

N/A

Primary author: BAMANA, BHARATI (UNIVERSITY OF JOHANNESBURG)

Co-authors: MOHANTY, Pankaj (University of Johannesburg); PRINSLOO, Aletta (University of Johannesburg); SHEPPARD, Charles (Department of Physics, University of Johannesburg)

Presenter: BAMANA, BHARATI (UNIVERSITY OF JOHANNESBURG)

Session Classification: Physics of Condensed Matter and Materials

Track Classification: Track A - Physics of Condensed Matter and Materials