

Growth and characterization of magnetite based artificial multiferroic heterostructure

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We study the morphology, electric, magnetic, magneto-electric coupling and magneto-transport properties of $\text{Fe}_3\text{O}_4/\text{Nb:SrTiO}_3(001)$ and $\text{Fe}_3\text{O}_4/\text{PMN-PT}(011)$ heterostructures. Studies like, interfacial capacitance, magnetic depth profile, ferroelectric ordering, stress and charge screening-control of the Verwey transition are of special interest. The Fe_3O_4 films are grown in an oxide molecular beam epitaxy system. We use x-ray diffraction and reflectometry for the structural characterizations, and atomic force microscopy (AFM) for the morphology of thin film. Magnetic and transport properties of the heterostructure are studied using superconducting quantum interference device (SQUID) magnetometer and physical property measurement system, respectively. We propose that probing the depth profile of magnetization using polarized neutron reflectometry (PNR) can reveal more information about the magnetic properties near the interface of such ferromagnetic/semiconductor heterostructures.

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