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Structural and Magnetic properties of $LaMnO_3$ Nanoparticles with varying La concentration

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In recent years, a lot of interests have been dedicated to research on rare earth manganese oxides having perovskite structure. These rare earth manganese oxides have stimulating properties such as colossal magnetoresistance and multiferroic effects [1]. These compounds could be used in magnetic storage media and as magnetic sensors. $LaMnO_3$ is a paramagnetic insulator with orthorhombic perovskite structure having T_N=140K [2].

In this work, we have studied the microstructure and magnetic properties of $LaMnO_3$ and excess La in $LaMnO_3$. Nanoparticles of both compounds are synthesized by co-precipitation route and are characterized by XRD and MPMS of Quantum Design operating between 2K to 320K to examine the structure and magnetic properties respectively.

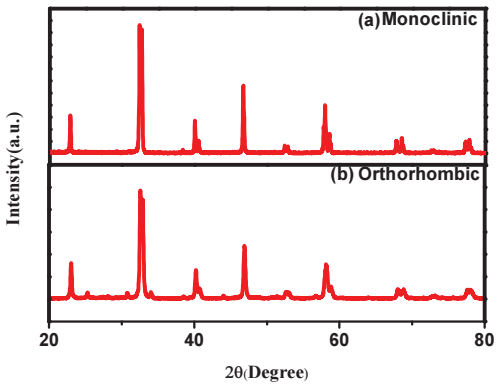

Figure 1: XRD patterns of $LaMnO_3$ (monoclinic) and $LaMnO_3$ with excess La (orthorhombic)

We observe that while $LaMnO_3$ show pure monoclinic phase of space group I2/a, $LaMnO_3$ with excess La show orthorhombic phase with Pbnm space group (Figure 1). Temperature dependent FC and ZFC magnetization of both samples are shown as Figure 2. Curie temperature, T_c is found to increase with increase in La concentration. Detailed magnetic properties dependent structures are discussed.

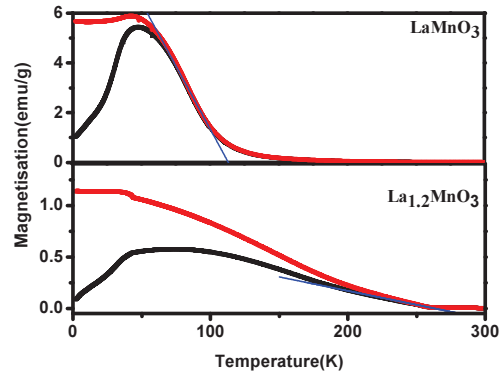

Figure 2: Temperature dependent magnetization plot of $LaMnO_3$ and $LaMnO_3$ with excess La

References

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2. Huang et al., Phy. Rev. B., 55 (1997)