MACRO SPIN FLUCTUATIONS IN DEFECT RICH NANO V2O5 ACROSS THE METAL INSULATOR PHASE TRANSITION

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Oxides with spin fluctuation/frustration are rare compared to other classes of solids like alloys. These are useful for spintronics since they have large magnetoresistance or other magnetic field response functions with spin fluctuations, which can be used in the design of sensor or switching devices. Amongst the oxides, oxides with oxygen ion defects were seen to generate spin fluctuations. The vacancy serves a lone-spin which when increases in density produces a correlative effect. The defect mediated spin fluctuation even though seen as transient is very useful for developing spin computing tools as well. V_2O_5 with oxygen ion defects is known to have an antiferromagnetic ordering at room temperature. Majorly the ordering was seen to be a function of dimensionality as well. Further, tuning of defect density and oxygen stoichiometry in these was seen to induce significant spin configuration change leading to tunable metal insulator transition. In the present work we investigate the spin fluctuations in V_2O_5 across the metal insulator phase transition. The V_2O_5 was synthesized in low dimensions using the sol-gel method. The structure is confirmed using XRD studies showing orthorhombic structure with lattice constants a=11.5 Å, b=3.56 Å and c=4.38 Å respectively. The spin fluctuation in these was studied using DC and AC magnetotransport measurements in high vacuum conditions; in the temperature range 10K to 300K. We observed DC magnetoresistance of the order of 50% with a positive sign, at room temperature indicating dipole-like macro spin interaction. Further at lower temperatures a systematic transition from dipole to exchange kind of interaction was observed with a broad change in resistance indicating localisation effect. The change in relaxation times with magnetic field indicated a strong spin fluctuation effect without any finite magnetic ordering. This study allows us to look for spin fluctuation driven field effect devices useful in spintronics.