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ACCEPTED MANUSCRIPT

Os Doped $YMnO_3$ Multiferroic: A Study Investigating the Electrical Properties through Tuning the Doping Level

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ABSTRACT:

Previously, it has been demonstrated the electrical and magnetic properties of $YMnO_3$ (YMO) can be tuned with substitution of different elements into Y and/or Mn sites. In this study, the electrical properties of YMO were explored via substituting osmium (Os) into Mn site with various mol %. The crystalline morphology of synthesized $YMnO_3$ and $YMn_{1-x}Os_xO_3$ (YMOO) (x = 0.01, 0.05, 0.10) powders were characterized with X-ray diffractometer (XRD) and infrared spectroscopy (IR) measurements. The crystalline morphology of synthesized powders was studied via scanning electron microscope (SEM). Oxidation states of constituent elements have been examined by X-ray photoelectron spectroscopy (XPS). Electrical properties of YMO and YMOO powders were investigated by dielectric/impedance spectrometer at various temperatures and frequencies. Electric modulus measurements unveiled that for each of x = 0, 0.01 and 0.05 samples there are three relaxation peaks while x = 0.10 sample shows four relaxation peaks. It has been shown that dielectric constant and conductivity properties of parent YMO can be enhanced via Os substitution, particularly, 10 mol % Os doped sample has the highest dielectric constant and conductivity at various temperatures and frequency regions. Moreover, the conduction mechanisms were also examined. It turned out that in order to explain conduction mechanism, multiple models need to be considered in the studied materials.

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