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Structural and Vibrational Studies of TbMn2O5 Powder

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Multiferroic rare-earth composite oxides with a perovskite-like structure such as terbium manganites hold a wide range of correlated properties for next-generational devices characterized by high efficiency, low energy dissipation, and high storage density among other high-end capabilities. Some of the envisaged applications include solid-state refrigeration, 4-state memory storage, ferroelectric photovoltaics, and spintronic devices.

In magnetoelectrics, ferroic orders (ferromagnetism and ferroelectricity) occur in the same phase by the virtue of symmetry breaking, which in this case is manifested in the form of crystal structure distortion. Motivated by the fundamental question of the structure-function relationship in these materials, we have synthesized TbMn2O5 powders (substrate-free nanostructures) by a sol-gel-based method.

The composition fidelity of the sample was probed and validated by SEM-EDX. Rietveld refinement shows that the as-synthesized sample has three phases: TbMn2O5 (89%), TbMnO3 (6%), and Mn3O4 (5% by volume). Except for the mode at 105 cm-1, all Raman modes of Ag, B1g, B2g, and B3g symmetry expected for the Pbam structure have been observed.

Keywords: Multiferroics, ferroic orders, magnetoelectric effect

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

Yes

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PhD

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