

Structural, Magnetic and Thermoelectric Properties of α -MnO₂ synthesized by Hydrothermal Process

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Abstract

α -MnO₂ was successfully prepared by hydrothermal technique using potassium permanganate (KMnO₄), hydrochloric acid (HCl) and DI water as raw materials. The phase formation of the product was confirmed by using x-ray diffraction (XRD) pattern which shows that the material was exactly manganese dioxide (pyrolusite) with rutile crystal structure, it was further confirmed by Rietveld refinement. Raman spectra also confirm the pure phase formation of the samples. FESEM images were taken to observe the surface morphology of the particles. Vibrating Sample Magnetometer (VSM) was used to evaluate the magnetic properties viz. hysteresis loop (M-H curve, ± 50 kOe) and magnetization vs. temperature (M-T curve, 10 - 300 K) in zero field cooling (ZFC) and field cooling (FC) mode with different field values. Hysteresis curve of the sample shows ferromagnetic like ordering at 10 K and also at the same temperature, the coercivity in the sample was observed to be 2.9 kOe and remnant magnetization was observed as 0.34 emu/g. Thermoelectric measurements of these samples show promising material to be used as energy harvesting application.

Keywords: Hydrothermal technique, magnetic properties, ferromagnetic ordering, XRD

References

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