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Synthesis and characterization of YMnO3-GdMnO3 solid solutions via sol-gel method

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Abstract

Recently, there has been a lot of interest in multiferroic materials, which exhibit two or more "ferroic" (ferromagnetism, ferroelasticity and ferroelectricity) properties at once. Those materials offer new range of applications like AC/DC magnetic field sensors, microwave resonators, new data storage media, gyrators and etc One of those materials is YMnO3. It has a relative high Curie temperature (TC ~ 900 K) and low Neel temperature (TN ~ 70 K). It was shown, that this material can couple both ferroelectric and antiferromagnetic properties. Other perovskite type material, where magnetic and ferroelectric orders coexist is GdMnO3. It was demonstrated that synthesis of different composition solid solutions is a promising tool for tuning of physical properties of functional materials.

In this study, solid solutions of YMnO3-GdMnO3 have been synthesized using an aqueous sol-gel method. The conditions for obtaining pure single-phase compounds were determined. The thermal behaviour of precursor gels was investigated by thermogravimetric and differential scanning calorimetry (TG-DSC) measurements. X-ray diffraction (XRD) analysis was performed for the characterization of phase purity and crystallinity. Rietveld analysis was employed to calculate lattice parameters of the synthesized species. For the investigation of structural properties of obtained solid solutions by Mössbauer spectroscopy, Mn ions were partially substituted with 57Fe. Scanning electron microscopy (SEM) was employed for the estimation of morphological features. Moreover, YMnO3-GdMnO3 specimens were also characterized by FT-IR, Raman spectroscopy. Also magnetization measurements were carried out for all samples.

Biography:

My name is Dovydas Karoblis. I'm a second Master's course student at Vilnius University. In my first four years in Bachelor's studies I was most focused on layered double hydroxide structures, their synthesis and determination. After that, my focus shifted on perovskite structure materials, expecially multiferroic manganites. In a short span of my scientific carrier I have attended several conferences (including Open Readings 2019, Chemistry and Chemical Technology and etc.) and participated in several projects (like BUNACOMP and TransFerr). Also I have one article in Journal of Sol-Gel Science with the title Novel synthetic approach to the preparation of single-phase BixLa1−xMnO3+δ solid solutions.

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Speaker Publications:

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5. A. Pal, C. Dhana Sekhar et al., J. Appl. Phys. 123, 014102(2018)

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