MS13-1-24 Synthesis and structural analysis of new materials ferroelectric \( \text{Ba}_{(2-x)}\text{Sr}_x\text{GdFeNb}_4\text{O}_{15} \) solid solution with (0 ≤ x ≤ 2)

Abstract

The structural study of \( \text{Ba}_{(2-x)}\text{Sr}_x\text{GdFeNb}_4\text{O}_{15} \) powders with (0 ≤ x ≤ 2) has been reported. All samples were prepared using the conventional solid-state reaction. XRD results confirmed that all compounds have a tetragonal tungsten bronze (TTB) structure with space group P4/mbm, where A 1 sites are exclusively occupied by Gd\(^{3+}\). Ba\(^{2+}\) and Sr\(^{2+}\) ions are located in the A2 sites while the Fe\(^{3+}\) and Nb\(^{5+}\) ions are randomly distributed between the B1 and B2 sites. The Raman spectra of the powders showed mainly multi-component and broad bands related to the internal vibrations of the octahedral MO\(_6\). The size of the A-site ions decreases when the Nb/Fe-O stretching changed. The evolution of the O–Nb/Fe–O bending vibrations as a function of the substitution rate x, seems to be a signature of the phase modifications. Infrared spectroscopy (IR) indicated the presence of stretching vibration bands as Nb/Fe-O, but also some strain vibration bands as H-O-H and O-H. Finally, Scattering Electron Microscopy (SEM) analyses show clearly the formation of TTB structure with uniform and dense grains with some phase of GdNbO\(_4\).