In-depth Analysis of Altering Fe Electronic Configuration Due to Doping in B Site Perovskite Structure

S. Suasmoro*
Department of Physics, Institut Teknologi Sepuluh Nopember Surabaya, Surabaya, Indonesia

F. Fitriana
Department of Physics, Universitas Negeri Surabaya, Surabaya, Indonesia

Abstract:

The composition of $La_{2x}Ba_{0.5-x}Sr_{0.5-x}Fe_{1-y}Ni_yO_{3-\delta}$ (x = 0, 0.25; y=0,0.1) materials were successfully synthesized through self-combustion technique followed by calcination at 850 °C for 6 hours and sintering st 1100 °C for 6 hours. Structural analysis confirmed the formation of a cubic perovskite structure, with Fe and Ni occupying octahedral coordination sites. The oxidation state was verified to be Fe^{3+}/Fe^{4+} and Ni^{4+}/Ni^{5+}. Spin state analysis using XAS suggested that Fe and Ni adopt a high-spin configuration in $Ba_{0.5}Sr_{0.5}FeO_{3-\delta}$ and $Ba_{0.5}Sr_{0.5}Fe_{0.9}Ni_{0.1}O_{3-\delta}$. When La substituted Ba/Sr in $La_{0.5}Ba_{0.25}Sr_{0.25}Fe_{0.9}Ni_{0.1}O_{3-\delta}$ the electronic configuration becomes a low spin state. The influence on physical characteristic (magnetization) will be presented and discussed.