

## Structural and Electron-hopping Studies of Pr and Nd substituted La<sub>2/3</sub>Ba<sub>1/3</sub>MnO<sub>3</sub> Manganites

### ABSTRACT

The significance of substituting concentrations of Pr and Nd at La-sites, in La<sub>0.67</sub>Ba<sub>0.33</sub>MnO<sub>3</sub> perovskite compounds, for the structural and electrical properties have been studied. Polycrystalline samples (La<sub>1-x</sub>Pr<sub>x</sub>)<sub>0.67</sub>Ba<sub>0.33</sub>MnO<sub>3</sub> and (La<sub>1-x</sub>Nd<sub>x</sub>)<sub>0.67</sub>Ba<sub>0.33</sub>MnO<sub>3</sub> with  $x = 0.00, 0.167, 0.333, 0.5, 0.667, 0.833$  and  $1.0$  were synthesized via conventional solid-state reaction in the bulk. All of the samples were calcined at 900°C for 12 hours, pelletized and sintered at 1300°C for 24 hours and investigated. In this paper the structural patterns and microstructural properties of bulk samples have been investigated via x-ray diffractometry (XRD) and scanning electron microscopy (SEM). XRD patterns show that these systems are single-phase, with orthorhombic distorted perovskite structures. The electrical property,  $T_p$ , was determined by using standard four-point probe resistivity measurements in the temperature range of 20 K to 300 K. The result shows that Pr and Nd dopants shift the value of  $T_p$  to a lower temperature. When the temperature is above  $T_p$ ,  $T > T_p$ , the variation of the electrical resistance was found to follow the an Arrhenius-type law,  $\rho = \rho_0 \exp(-E_a/KBT)$ . It was used to calculate the activation energy of every sample. The resistivity curves show semiconducting behavior of all samples above their  $T_p$ .

**Keyword:** Arrhenius-Type Law Activation Energy ( $E_a$ ); Meta-Insulator Transistor Temperature ( $T_p$ ); Resistivity ( $\rho$ )