# STRUCTURAL EFFECTS ON THE ELECTRICAL TRANSPORT PROPERTIES OF PEROVSKITE $La_{0.67}Ca_{0.33}MnO_3$ WITH CuO SUBSTITUTION.

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May Allah bless all of you.

Noor Ezati Binti Shuib

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## ABSTRACT

### STRUCTURAL EFFECTS ON THE ELECTRICAL TRANSPORT PROPERTIES OF PEROVSKITE $La_{0.67}Ca_{0.33}MnO_3$ WITH CuO SUBSTITUTION.

The structural effects on the electrical transport of copper substituted $La_{0.67}Ca_{0.33}Mn_{1-x}O_3$ system in the perovskite structure investigated. The substitution of Mn sites by magnetic cations such as Cu induces ferromagnetism and metallicity in the paramagnetic matrix of the manganites. The magnetic and transport properties of the manganites mainly characterized by a competition between ferromagnetism-paramagnetism and metallic-insulating behavior. The transport mechanisms can be explained by Double Exchange (DE) and Jahn-Teller, JT-polaron effect. The transport mechanisms involved in the transition from metallic (ferromagnetism) to insulator (paramagnetism) of composites determined. The substitution of Cu at Mn-site on $La_{0.63}Ca_{0.33}MnO_3$ ceramic was through solid state reaction. $La_{0.67}Ca_{0.33}Mn_{1-x}O_3$ (x = 0.00,0.15,0.30) doped with Cu ion, calcined at 900°C for 12 hours, pelleted and sintered at 1200°C for 24 hours in air. The peak transition temperature, $T_p$ determined by using standard four-point probe resistivity measurement devices. From the measurement, it shown that as the value of x increased, the resistvity increased and the $T_p$ shifted to lower temperature. The $T_p$ for x = 0.15 and 0.30 is 234.9 K and 173 K respectively as compare with the higher $T_p$ for pure LCMO is 258 K. The resistivity, ρ for x = 0.00, 0.15 and 0.30 is 1.43, 2.71 and 94.3 Ω.cm, respectively. The investigation of the grain size and examination of the composition of the sample was done by using Scanning Electron Microscope (SEM). From SEM studies, clear grain boundaries observed that show inter-diffusion between LCMO and CuO take place at interfaces.