

Phase transitions in $\text{La}_{0.73}\text{Ca}_{0.27}\text{Mn}_{1-x}\text{Cu}_x\text{O}_3$ ($0 < x < 0.19$)

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Abstrak

We have performed resistivity measurements as a function of temperature, with and without an external magnetic field. Magnetization measurements are also done as a function of temperature $M(T)$ as well as a function of an external magnetic field $M(H)$ for $\text{La}_{0.73}\text{Ca}_{0.27}\text{Mn}_{1-x}\text{Cu}_x\text{O}_3$ compounds with $0 < x < 0.19$. The samples with $x = 0$ and 0.06 are insulators. As for the samples with $x = 0.10$, 0.13 , and 0.19 , they undergo an insulator to metal transition as the temperature is lowered. The insulator-metal transition temperatures are 24 K, 74 K, and 69 K for $x = 0.10$, 0.13 , and 0.19 , respectively. The magnetoresistance decreases with increasing values of Cu, i.e. 75% , 72% , 64% , and 35% for $x = 0$, 0.06 , 0.10 , and 0.13 respectively. Samples in accordance with the model of crystalline metal $\ln R$ vs. $1/T$ are compared to Mott insulator models $\ln R$ vs. $1/T^{0.25}$. Based on the magnetization curve, a paramagnetic to ferromagnetic transition is observed at Curie temperature, T_C , of ~ 196 K, 170 K, 140 K, 137 K, and 113 K for $x = 0$, 0.06 , 0.10 , 0.13 , and 0.19 respectively.