

Temperature Dependent Tunneling Study of $\text{La}_{0.625}\text{Ca}_{0.375}\text{MnO}_3$ Thin Films

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We report on the temperature dependent tunneling study of $\text{La}_{0.625}\text{Ca}_{0.375}\text{MnO}_3$ (LCMO) strain free epitaxial thin films' surface using scanning tunneling microscopy and spectroscopy. The bulk resistivity of the films shows an insulator-metal transition at a temperature of 250 K. The tunneling spectra do not change very significantly with temperature. We find a depression in the normalized tunneling spectra corresponding to the density of states (DOS) in an energy range of about $\pm 0.3\text{eV}$. But the DOS at E_F is always finite so we interpret this feature as a pseudogap. There is little frozen spatial inhomogeneity at all temperatures from 78 K to 310 K corresponding to a slight variation in the pseudogap. This pseudogap energy scale has a jump of about 0.1 eV near the insulator-metal transition temperature. We discuss these results with a pseudogap scenario and also with the possibility of the surface behaving differently from the bulk.