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Perovskite CaMnO3 (CMO) is the parent compound of materials with several emergent magnetic phenomena, such as colossal magnetoresistance in (La,Ca)MnO3 and interfacial ferromagnetism in CMO/CaRuO3 superlattices consisting of two non-ferromagnetic materials. In bulk it is a G-type antiferromagnetic (AFM) insulator with a Neel temperature of approximately 120K. In thin film form, its properties can deviate from the bulk due to variations in stoichiometry, epitaxial strain state etc. We have studied the magnetic and transport properties of tensilely strained and relaxed CMO thin films grown on LaAlO3 and SrTiO3 substrates respectively. Films were grown by reflective high energy electron diffraction (RHEED) assisted pulsed laser deposition at 700°C and in an oxygen atmosphere ranging from 0.03mtorr to 80mtorr. X-ray diffraction indicates that CMO films grown on (001) LaAlO3 substrates are under coherent tensile strain while those on (001) SrTiO3 substrates are fully relaxed due to the larger film-substrate lattice mismatch. X-ray absorption spectroscopy indicates that the Mn cations are largely in a 4+ state. We found oxygen vacancies to play different yet important roles in strained CMO and relaxed CMO. In the tensilely strained CMO thin film, lower oxygen pressure growth that induces oxygen vacancies suppresses the antiferromagnetic (AFM) transition. The transition decreases from 111K to 94K as the growth pressure is decreased from 80mtorr to 0.03mtorr. In relaxed CMO thin films, the AFM transition is extremely robust to variations in oxygen growth pressure. Through a careful study of electrical transport in both types of CMO thin films, we find that they exhibit a small polaron type electrical transport $\ln(\rho/T) \sim 1/T$ above the AFM transition temperature and the Efros-Shklovskii type hopping law $\ln(\rho) \sim 1/T^{1/2}$ below the transition.

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