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Voltage-induced entropy change in complex oxide thin films via electrostatic doping.[1] PRAKASH GIRI, University of Nebraska - Lincoln, DHANANJAY KUMAR, North Carolina Agricultural and Technical State University, CHRISTIAN BINEK, University of Nebraska - Lincoln — The quest for cost-effective, energy efficient and environmental friendly cooling system has driven unconventional refrigeration technology by utilizing magnetocaloric, electrocaloric, barocaloric and elastocaloric-materials. For the latter class of materials strain, e.g., electrically induced via adjacent piezoelectric materials is used to change the structure and thereby entropy of the material. We in contrast propose to use voltage to change the magnetic order and thereby entropy. In a complex oxide thin film such as $La_{0.7}Sr_{0.3}MnO_3$, strain and electric field can change anisotropy and magnitude of magnetization. Only the latter has the potential to lead to entropy change. In heterostructures of LSMO and ferroelectrics it is difficult to disentangle both effects because all ferroelectrics are piezoelectric. We therefore employ pure electrostatic doping in the absence of strain to achieve isothermal entropy change in LSMO from voltage-induced change of its magnetic state. We use the quantum paraelectric $SrTiO_3$ with high dielectric constant but no spontaneous polarization to fabricate LSMO/STO heterostructures via pulsed laser deposition. We measure the voltage-induced variation in magnetization via SQUID magnetometry and determine the isothermal entropy change with the help of Maxwell's relation.

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