

Stripe-type order of spin, orbitals and charges in single-layered manganites

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Stripe-type or checkerboard ordering of charges and orbitals in metal-oxide compounds is linked to exotic behavior such as high-temperature superconductivity and colossal magnetoresistivity. We studied two single-layer manganites with a doping level slightly above half-doping, $x > 0.5$, $\text{La}_{0.42}\text{Sr}_{1.58}\text{MnO}_4$ (LSMnO) and $\text{Pr}_{0.33}\text{Ca}_{1.67}\text{MnO}_4$ (PCMnO). For this doping range there are essential controversies about the nature of the charge orbital and spin order. The neutron-scattering experiments on LSMnO yield clear evidence for ferromagnetic zigzag chains being disrupted by stripes of excess of Mn^{4+} ions¹. In this material three incommensurate and one commensurate order parameter are tightly coupled. Elastic neutron scattering on PCMnO reveals incommensurate magnetic scattering of Mn^{4+} spins and commensurate scattering of Mn^{3+} spins which is opposite to our finding for LSMnO. The spin-wave dispersion in PCMnO starting at the incommensurate magnetic zone-centers point to a dispersion resembling the hour-glass dispersion in cuprates and $\text{La}_{1.67}\text{Sr}_{0.33}\text{CoO}_4$.

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