BEHAVIOR OF COBALTITES UNDER PRESSURE: FACTORS CONTROLLING THE SIGN REVERSAL OF PRESSURE EFFECT

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9.7 cm

Ferromagnetic perovskite cobaltites $La_{1-x}M_xCoO_3$ (M = Ca, Sr, Ba) have unusual magnetic and transport properties due to the unique feature of the Co ion to change its spin-state. Their large sensitivity to the external pressure is caused by the strong dependence of the crystal-field splitting energy $\Delta_{cf} \sim (d_{Co-O})^{-5}$ on variation in the Co-O bond length $\sim d_{Co-O}$. They demonstrate a complex dependence of pressure coefficient dT_C/dP both on doping level and on size of dopant ion. An essentially positive dT_C/dP coefficient found for Ba compound is in strong contrast to that one found for Ca and Sr cobaltites, where the dT_C/dP changes sign from negative to positive with increasing doping. We demonstrate that the sign reversal of dT_C/dP can be caused by the hole-doping and also, independently, by the lattice expansion only, realized by increasing size of dopant ion at constant hole-doping level. It is shown also that the complex pressure effect on ferromagnetic transition T_C in cobaltites can be successfully described in terms of the competing e_g-electron bandwidth W and crystal-field splitting energy Δ_{cf}, taking into account the pressure dependent steric factors.

13.4 cm

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