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Abstract

Heavy-rare-earth-doped (HR-doped) $(Sr_{2-x}Ln_x)FeMoO_6$ (x = 0, 0.1 and 0.15, Ln = Sr, Gd, Tb, Dy, Y and Ho) have been synthesized by solid-state reaction. Crystal structure, magnetic and transport properties of the compound are investigated systematically. Structural refinement shows that although all the compounds belong to the same space group, I4/m, prominent structural distortion is introduced: all the compounds seem to be divided into two groups: for $(Sr_{2-x}Gd_x)FeMoO_6$ and $(Sr_{2-x}Tb_x)FeMoO_6$ compounds, FeO_6 octahedra becomes expansive and MoO_6 octahedra becomes contractive, while FeO_6 octahedra is compressed and MoO_6 octahedra is stretched for the other compounds. Owing to the competing interaction between structural distortion and electron doping, T_C of $(Sr_{2-x}Gd_x)FeMoO_6$ and $(Sr_{2-x}Tb_x)FeMoO_6$ is increased, resistivity is decreased and metallic behavior is enhanced, while the reverse occurs to the other compounds. Saturation magnetization of $(Sr_{2-x}Ln_x)FeMoO_6$ suggests that the long-range-ordered-moments of Gd^{3+}, Tb^{3+}, Dy^{3+} and Ho^{3+} maybe parallel with that of Fe^{3+} spin at low temperature, which is the same as La-, Ce-, Pr-, Nd- and Sm-doped case. Above results reveal that rare earth elements (La-Ho, except for Eu) exhibit the same coupling effect with Sr_2FeMoO_6, despite of their different magnetic nature. Our investigation offer comprehensive knowledge on the structural and magnetic properties of rare-earth-doped Sr_2FeMoO_6.

Key words: Heavy-rare-earth, Double perovskite, Crystal structure, Magnetic property

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