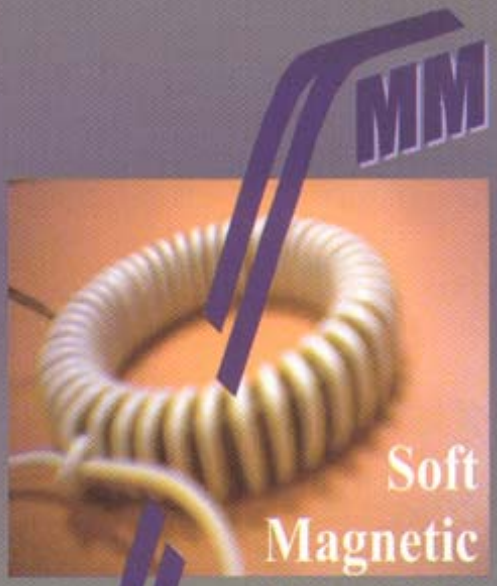

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CARRIER DOPING DEPENDENCE OF T_C IN DOUBLE PEROVSKITES A_2FeMoO_6 (A = Sr AND Ba)

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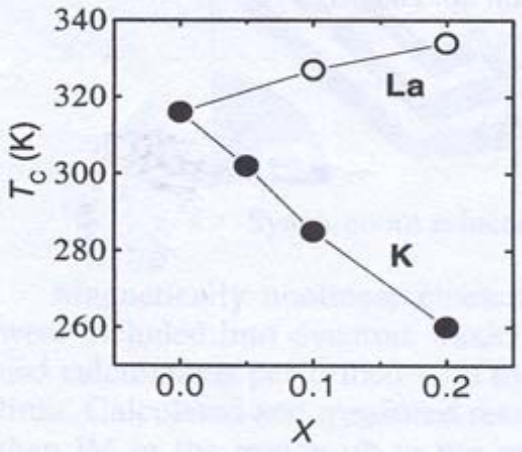
We have studied effects of the carrier doping on the magnetic transition of double perovskites A_2FeMoO_6 (A = Sr and Ba). The substitution of La^{3+} (or K^+) in A_2FeMoO_6 changes the average ionic radius ($<r_A>$) without distorting the crystal symmetry and the valence state of Fe/Mo ions via carrier doping.

Polycrystalline $A_{2-x}B_xFeMoO_6$ (B = La and K; x = 0, 0.1 and 0.2) samples were prepared by standard solid-state reaction. X-ray diffraction patterns reveal that samples are single-phase with cubic *Fm3m* symmetry for A = Ba and tetragonal *I4/mmm* symmetry for A = Sr. Lattice parameter of $Ba_{2-x}La_xFeMoO_6$ decreases from 8.076 Å for x = 0 to 8.045 Å for x = 0.2 upon La substitution. This considerable reduction of lattice parameter arises from the substitution of the smaller La^{3+} ions into the Ba^{2+} ionic sites. However, the lattice parameter of $Ba_{2-x}K_xFeMoO_6$ decreases slightly to 8.074 Å for x = 0.2, which is due to the similar ionic radius between $K^{1+}$and Ba^{2+}. In $Sr_{2-x}K_xFeMoO_6$ the lattice parameters increase monotonically with increasing x due to the substitution of bigger K^+ ions.

A plot of the T_c *vs* carrier doping concentration for $Ba_{2-x}B_xFeMoO_6$ (B = La and K) is shown in figure. Open symbols represent data for $Ba_{2-x}La_xFeMoO_6$ and filled symbols correspond to data for $Ba_{2-x}K_xFeMoO_6$. The magnetic transition temperature T_c is defined as the temperature of the inflection point of *M (T)* curve. In $Ba_{2-x}La_xFeMoO_6$ the T_c increases at a rate of 1.8 K/% with increasing La doping. The T_c is 316 K for x = 0 and 334 K for x = 0.2. However, the T_c of $Ba_{2-x}K_xFeMoO_6$ decreases at a rate of 5.6 K/% with K doping. The T_c for $Ba_{1.8}K_{0.2}FeMoO_6$ (x = 0.2) is 260 K. Similar to $Ba_{2-x}K_xFeMoO_6$, the T_c for $Sr_{2-x}K_xFeMoO_6$ decreases from 379K for x = 0 to 368 K for x = 0.1. The partial substitution of La^{3+} (K^+) for Ba^{2+} in Ba_2FeMoO_6 changes the $<r_A>$ within the cubic symmetry and the valence state of Fe/Mo ions via electron (hole) doping. The lattice parameters of $Ba_{2-x}La_xFeMoO_6$ and $Ba_{2-x}K_xFeMoO_6$ are found to vary linearly with the $<r_A>$. As the $<r_A>$ decreases, the electronic bandwidth becomes broader, and thus the T_c increases [1]. In $Ba_{2-x}K_xFeMoO_6$ system, the lattice parameter decreases with K doping; this should lead to the raise of T_c. However, T_c decreases slightly with increasing K concentration. This indicates that the carrier doping can promote some modification of T_c in these oxides.



[1] RITTER, C. – IBARRA, M. R. – MORELLON, L. – BLASCO, J. – GARCIA, J. – De TERESA, J. M.: J. Phys.: Condens. Matter, **12**, (2000), 8295.

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