[We-P-54]
EPR study of solid solution $La_{1-0.33y}Ba_{0.33y}Mn_yAl_{1-y}O_3$ (y = 0.02; 0.04; 0.10)

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Solid solution $La_{1-0.33y}Ba_{0.33y}Mn_yAl_{1-y}O_3$ (y = 0.02; 0.04; 0.10), prepared following ceramic technology, was investigated by EPR method at 77 K and 300 K.

Observed EPR spectra were interpreted as belonging to Mn^{2+} ions (at T=77 K g = 2.04; linewidth ΔH_{pp}=64 $\times 10^{-4}$ T) and Mn^{4+} ions (at T=77 K, g = 1.97; ΔH_{pp} =76$\times 10^{-4}$ T); as well as belonging to clusters of magnetically coupled Mn ions corresponding to broad line with linewidth at T=77 K ΔH_{pp} =500$\times 10^{-4}$ T. The interpretation was based on rigorous simulation of experimental EPR spectra with software, which uses exact diagonalization of spin –Hamiltonian matrix. The dilution of Mn ions in solid solution of $La_{0.67}Ba_{0.33}MnO_3$ in diamagnetic $LaAlO_3$, enable to investigate cluster formation and spin dynamics of Mn ions in such diluted system. In the system under investigation with Ba^{2+} ions, compared to system with Sr^{2+} ion, which has small ionic radius, EPR lines belonging to localized Mn ions are more intensive at room temperature and, in the same time, broad lines, belonging to Mn clusters, are very intense. The temperature dependence of linewidth, consistent with that in concentrated compounds, was observed. The clusters of $La_{0.67}Ba_{0.33}MnO_3$, diluted in $LaAlO_3$, keep to some extent magnetic properties of initial manganite even at doping level of y = 0.02, and role of such clusters increased here compared to $La_{1-0.33y}Sr_{0.33y}Mn_yAl_{1-y}O_3$ [1].

In the samples, where, La^{3+} ion was partly substituted by Ba^{2+} ion (x=0.33), at 77 K isolated manganese ion were observed only at low concentration of Mn (y=0.02), in the same time at y=0.04 and 0.10 amount of clusters increases in great extent, what corresponds to the predominance of wide line (ΔH_{pp}= 500 $\times 10^{-4}$ T)[2]. Observed EPR spectra at 300 K exhibit localized state of manganese ions along with clusters at all three concentration of manganese. Since, in investigated samples compared with Sr containing solid solutions, ferromagnetic interactions are much stronger in low temperature region, which is correlated with formation of the clusters, such as Mn^{3+}- Mn^{4+} - Mn^{3+}. These clusters include significant amount of manganese ions, while at T = 300 K, localized states play more important role.

Considerable difference in EPR spectra of samples of $La_{1-0.33y}Ba_{0.33y}Mn_yAl_{1-y}O_3$ and $La_{1-0.33y}Sr_{0.33y}Mn_yAl_{1-y}O_3$, as well with EPR spectra of $LaAl_{1-x}Mn_xO_3$ [3], clearly show, that Ba and Sr ions are included in magnetic clusters and these ions modify magnetic properties of these manganese clusters. Therefore, even at strong dilution in such systems, manganese clysters keep "the memory" about initial concentrated compounds, $La_{0.67}Ba_{0.33}MnO_3$ and $La_{0.67}Sr_{0.33}MnO_3$, respectively.

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