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MS16-P3 High pressure synthesis of iron complex oxides in high oxidation state (Fe^{4+}, Fe^{5+}): mapping between localized and itinerant behavior

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In 1993 colossal magnetoresistance (CMR) was found in $La_{1-x}Ba_xMnO_3$ at the Curie point where electrical resistance changes by orders of mȧgnitude when a magnetic field is applied. Up to now, most of the known CMR materials are manganese based perovskites – mostly $La_{1-x}Sr_xMnO_3$ or $SmBaMn_2O_6$ [1]. Analysis of the potential map that was proposed by Kamata et al. [2] suggests that CMR could also be obtained in $A_xB_{1-x}FeO_3$ (where A=Na, K, Rb and B= Ca, Sr, Ba) perovskites. These proposed iron based compounds should display similar electrical transport properties to the manganese perovskites being in vicinity to metal-insulator border line in the potential map. Additionally, both families should be isoelectronic: Fe^{4+} and Fe^{5+} have the same electron configuration as Mn^{3+} and Mn^{4+} in $La_{1-x}Sr_xMnO_3$. To stabilize these unusually high oxidation states, and to achieve oxygen stoichiometry, $Sr_{1-x}A_xFeO_3$ (A=Na, K) have been synthesized by using a unique oxygen high pressure (HP) system recently relocated and already successfully used in our lab [3]. This HP system allows precise control of temperatures (up to 1200 ^{o}C), gas pressures (up to 2000 bars) and large production of materials (cm^3). The synthesized materials are phase pure and have structure similar to the parent compound (space group *Pm-3m*). Measurements of the magnetic susceptibilities and electric properties for these materials are currently underway. Determination of the magnetic structure of the materials by neutron powder diffraction has also been scheduled.

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