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### **Topotactic Reduction of Complex Manganese Oxides**

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Mixed-valent manganese (III/IV) perovskite and Ruddlesden-Popper oxides have received considerable attention due to the observation of strong coupling between spin, charge and lattice degrees of freedom in these materials. Little attention however has been focused on the analogous Mn (II/III) oxides due to the difficulty of their synthesis. The topotactic reduction of the Mn(III/IV) perovskites  $\text{La}_{1-x}\text{Sr}_x\text{MnO}_3$  ( $0.2 < x < 0.4$ ) results in the formation of the corresponding  $\text{La}_{1-x}\text{Sr}_x\text{MnO}_{2.5}$  brownmillerite phases. The  $x = 0.25$  and  $0.2$  phases adopt structures with an unusual ordered L-R-L-R alternation of twisted chains of Mn(II) tetrahedra which is accompanied by Mn(II)/(III) charge ordering within the remaining  $\text{MnO}_6$  octahedral layers. In contrast the  $x = 0.4$  phase adopts a structure in which the twisted chains of tetrahedra are disordered. Temperature dependant magnetization data collected from similarly reduced  $n = 2$  Ruddlesden-Popper phases of composition  $\text{YSr}_2\text{Mn}_2\text{O}_{7-x}$  ( $0 < x < 1.5$ ) indicate strong antiferromagnetic coupling interactions in all samples. Long range magnetic order is suppressed by structural and/or charge disorder in all samples except  $\text{YSr}_2\text{Mn}_2\text{O}_{5.5}$  which adopts a G-type antiferromagnetic ordering scheme.