MS123.O03

Neutron studies on high pressure A-site manganites.

Angel M Arevalo Lopez[1], Graham McNally[1], Elena Solana Madruga[2], Antonio J Dos santos Garcia[3], Regino Saez Puche[2], J Paul Attfield[1]

[1]Department Of Chemistry, University Of Edinburgh, Edinburgh, United Kingdom, [2]Departamento de Quimica Inorganica I, Universidad Complutense de Madrid, Madrid, Spain, [3]Departamento de Ingenieria mecanica, quimica y diseño industrial, Universidad Politecnica de Madrid, Madrid, Spain

E-mail: aalopez@staffmail.ed.ac.uk

The discovery of new materials with appealing functional properties is challenging and such properties are often observed in complex oxides containing transition metals in intermediate or unusual oxidation states which must be stabilised under special synthetic conditions.

A2+ cations in perovskites synthesized at ambient pressures are typically large, nonmagnetic atoms, such as A = Ca, Sr, Ba, Pb. However, materials with the smaller high-spin Mn2+ ion at A sites have been synthesized under high-pressure and high-temperature conditions. This may introduce additional functionality as found in MnVO3 perovskite which is metallic but also has coexisting helimagnetic order of localized S = 5/2 Mn2+ spins [1].

Several Mn2BB'O6 double perovskites have also been synthesized at high pressures. Mn2FeReO6 has a high Curie temperature of 520 K and similar ferrimagnetic and spin polarized conducting properties to the much-studied magnetoresistive material Sr2FeMoO6, but also shows a novel switch from negative to large positive magnetoresistances at low temperatures driven by Mn2+ spin ordering [2]. In contrast, Mn2MnReO6 (Mn3ReO6) shows successive antiferromagnetic ordering transitions for Re and Mn spins at 99 and 109 K, respectively. Our subsequent investigation of possible rare earth (R) double perovskites Mn2RSbO6, has led to the discovery of a new double double perovskite type for MnRMnSbO6 with large R cations, as well as more conventional (MnR)MnSbO6 double perovskites formed for smaller rare earth metal ions.

The new type of double double perovskite structure in the MnRMnSbO6 (R= La, Pr, Nd, and Sm) family has a columnar order of A-site Mn2+ and R3+ cations whereas Mn2+ and Sb5+ have rock salt

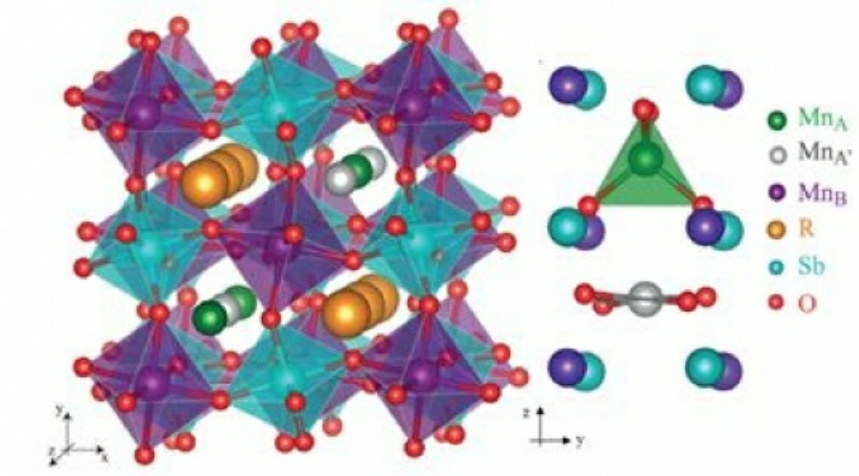
order on the B sites. Mn2+ cations are in tetrahedral and square-planar A-site environments and octahedral B sites, see Figure 1 [3].

In this work, we present our endeavour on new Mn2+ oxides obtained under high pressure along with structural and physical properties studies.

[1] M. Markkula et al. (2011) Phys. Rev. B, 84, 094450.

[2] A. M. Arévalo-López et al. (2015) Angew. Chem. Int. Ed.. 54,12074-12077.

[3] E. Solana-Madruga et al. (2016) Angew. Chem. Int. Ed.. 55,9340-9344.



Keywords: high pressure synthesis, neutron diffraction, perovskites