

XAS Studies of $\text{Sr}_2\text{CrNbO}_6$

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The observation of colossal magnetoresistance in mixed valent perovskite manganites has stimulated substantial transition metal oxide science. Recently the search for new materials has expanded to ordered double perovskites [i.e. $\text{A}_2\text{B}'\text{B}''\text{O}_6$ materials] such as $\text{Sr}_2\text{FeMoO}_6$. Here we discuss x-ray absorption spectroscopy (XAS) measurements at the Cr-K and Nb-L_{2,3} edges to probe the important charge balance in one such system $\text{Sr}_2\text{CrNbO}_6$.

Figure 1 (left) shows the Cr-K main-edge for this sample along with a Cr_2O_3 standard. Despite the disparities of the edge-features between these, Cr-K edges their correspondence at the absorption coefficient of ~ 0.9 (see box in figure), clearly supports a Cr^{3+} assignment for $\text{Sr}_2\text{CrNbO}_6$. In Figure 1 (right) the Cr-K pre-edges of these compounds manifest nearly identical a1-a2 features thereby confirming the Cr^{3+} assignment for the double perovskite. Thus the Cr K- main and pre edge results provide a solid basis for the Cr^{3+} state in this compound. Figure 2 shows the Nb L_{2,3} edges for $\text{Sr}_2\text{CrNbO}_6$. The A (B) features, in Figure 2, involve transitions into t_{2g} (e_g) final states, and their relative intensity provides evidence as to the hole counts in these orbitals. The relative A/B intensity, for this compound, is typical for a $4d^0$ (i.e. Nb^{5+}) compound as indicated by numerous previous studies by our group. Thus the XAS measurements microscopically fix the B':B'' site valence state distribution as a 3:5 the $\text{Sr}_2\text{CrNbO}_6$ double perovskite.

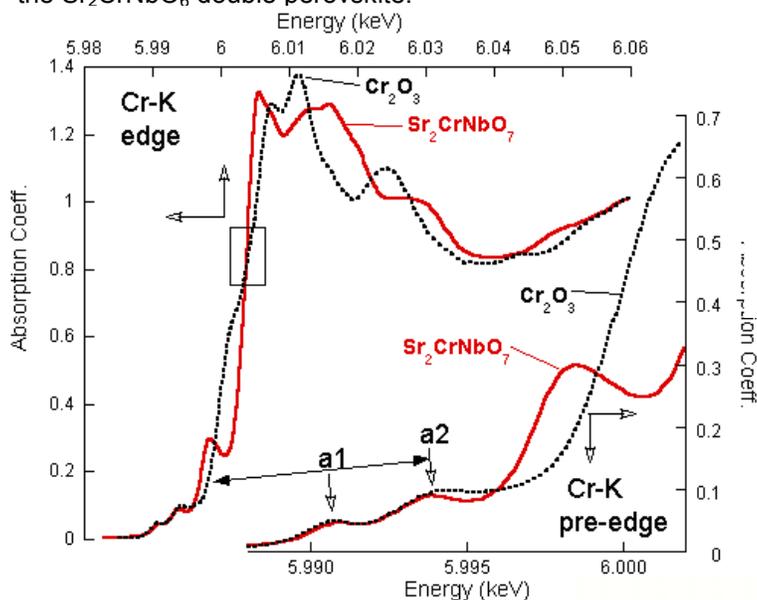


Figure 1 The main and pre-edge regions of the Cr-K edges of: $\text{Sr}_2\text{CrNbO}_6$ and $\text{Cr}^{3+}_2\text{O}_3$.

Figure 2 The Nb-L_{2,3} edge for $\text{Sr}_2\text{CrNbO}_6$ along with the elemental Nb-L₃ edge.

