ABSTRACT

Comparison of the phase diagrams for the RMnO$_3$ and RNiO$_3$ families (R = rare-earth) show the influence of a strong intraatomic Hund exchange on the MnO$_3$ array, which approaches the Mott-Hubbard transition from the localized-electron side in LaMnO$_3$, and of the stronger O-2p component in the e$_g$ orbitals of the NiO$_3$ array, which passes through the Mott-Hubbard transition between SmNiO$_3$ and LaNiO$_3$. The first-order character of the Mott-Hubbard transition at lower temperatures is demonstrated for mixed-valent as well as single-valent systems, for metal-metal as well as metal-oxygen-metal interactions. Comparisons of the transport properties of Fe$_3$O$_4$ above the Verwey transition with those of La$_{1-x}$Sr$_x$CuO$_4$, of the RMnO$_3$ family above the orbital-ordering temperature, and of the RNiO$_3$ family above the insulator-metal transition show that at higher temperatures the mobility of the charge carriers makes a smooth transition from polaronic to vibronic to itinerant behavior with increasing bandwidth.