Magnetic, Transport, and Structural Studies of Manganites
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Beamline(s) X18B, X23A2

Introduction: As a function of temperature, pressure, doping, and A \(^{3+}/A'^{2+}\)-site ionic radius, perovskite mixed-valent manganites A\(^{3+}\)\(_{1-x}\) A'\(^{2+}\)\(_{x}\)MnO\(_3\) (e.g. A\(^{3+}\) = Bi, La, Pr, Nd, etc. and A'\(^{2+}\) = Ca, Sr, Ba, Pb, etc.) show intriguing properties such as: structural transformations, charge ordering, metal-insulator transitions and magnetic ordering (ferromagnetic (FM) - antiferromagnetic (AF)) transformations. [1]

Methods and Materials: We have prepared a series of BCMO (x \(\geq 0.4\)) polycrystalline samples using the standard solid-state reaction method. Stoichiometric mixtures of Bi\(_2\)O\(_3\), CaCO\(_3\) and MnO\(_2\) were mixed, ground, and pressed into pellets which were calcined at 900 °C. After calcination, the samples were reground and sintered at 1000 °C in air. X-ray absorption spectra were measured at X18B and X23A2.

Results: Detailed magnetization measurements were performed as a function of field and temperature to explore the net moment on the Mn sites as a function of x and reveal the charge ordering and Néel temperatures. X-ray absorption measurements reveal significant structural distortion in the Mn-O bond distributions with increasing Bi content which correlates directly with increasing charge ordering temperatures. Representative raw x-ray absorption spectra data are shown in Fig. 1 as an inset for x = 0.9. Note that only small changes in amplitude occur with temperature.

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