Magnetic phase separation in SrCoO$_{2.5+x}$

CHANGKUN XIE, YUE-FENG NIE, BARRETT WELLS, JOSEPH BUDNICK, WILLIAM HINES, University of Connecticut, BOGDAN DABROWSKI, Northern Illinois University — We study phase separation and inhomogeneities induced by oxygen non-stoichiometry in SrCoO$_{2.5+x}$. In previous work [A. Nemudry, et. al. Chem. Mater. 8, 2232(1996)], it has been shown that as oxygen is driven into the SrCoO$_{2.5}$ electrochemically, the material structurally separates into two different phases: one is antiferromagnetic SrCoO$_{2.5}$, and the other is ferromagnetic SrCoO$_{2.75}$. We show that two distinct ferromagnetic phases appear for SrCoO$_{2.88}$ and SrCoO$_{3}$, with $T_c = 220$ K and 280 K, respectively. The phase diagram of SrCoO$_{2.5+x}$ suggests the four magnetic line phases are the only stable ground states in the system. While antiferromagnetic SrCoO$_{2.5}$ is orthorhombic, the three ferromagnetic phases are pseudo-cubic and, unlike the magnetic properties, do not show the coexistence of different structures. The existence of distinct $T_c = 220$ K and $T_c = 260$ K magnetic phases with no structural differentiation indicates the presence of magnetic phase separation.

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