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A Charge Density Wave Transition in Non Superconducting $\mathbf{Na_{0.35}CoO_2 \cdot 1.3H_2O}$ R.A. FISHER, H. FU, D.-H. LEE, N. OESCHLER, N.E. PHILLIPS, LBNL and University of California, Berkeley, R.J. CAVA, M.-L. FOO, Princeton University — For most superconducting samples of $Na_{0.35}CoO_2 \cdot 1.3H_2O$ the transition to the superconducting state occurs near 4.5 K. For some non-superconducting samples a different transition, near 7 K, shows the existence of another ordering that competes with the electron pairing of the superconducting state. Specific-heat measurements in zero field and 9 T show that the 7-K transition is essentially independent of field, which is suggestive of a CDW transition. The specific-heat anomaly is consistent with a CDW on 1/4 of the Fermi surface and an order parameter with a temperature dependence similar to that of the BCS transition. A theoretical study using a band-structure fit to ARPES data for $Na_{0.3}CoO_2$ supports the presence of CDW order. Under renormalization group flow an onsite plus nearest-neighbor Hubbard interaction leads to an effective low-energy electron-electron interaction containing scattering processes that favor a CDW with waves of period $3^{1/2}$a, where a is the lattice constant. A mean-field analysis confirms that this effective low-energy interaction can lead to real-space density modulations with period $3^{1/2}$a.

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