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Effect of heavy water intercalation in sodium cobaltate . CINZIA METALLO, University of Tennessee, TAKESHI EGAMI, University of Tennessee, Oak Ridge National Laboratory, THOMAS PROFFEN, Los Alamos National Laboratory, DAVID MANDRUS, Oak Ridge National Laboratory, BRIAN SALES, Oak Ridge National Laboratory, RONGYING JIN, Oak Ridge National Laboratory — Superconductivity in the hydrated compound $Na_xCoO_2yH_2O$ (x=0.35, y=1.3) is directly related to water intercalation. Nevertheless, so far, no clear explanation of the effect of water on the superconducting mechanism has been given. Here we present our study on deuterated sodium cobaltate $Na_xCoO_2yD_2O$ (x=0.35, y=1.4) at two different temperatures, T=15K, 100K. Neutron diffraction data were analyzed using the PDF technique. The PDF of $Na_xCoO_2yD_2O$ was compared with the PDF of heavy water. The diffraction spectra at both temperatures show a weak D-D correlation, and a pronounced D-O correlation. The weakened D-D correlations imply that the dynamics of the hydrogen bond is modified. This increases the dielectric response, and may enhance the electron-phonon coupling. Our results suggest a modification of the geometry of the heavy water molecules inserted in Na $_xCoO_2$, and subsequently a possible active role of water in setting the superconducting state.

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