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**Phase Diagrams, Thermodynamic Quantities and Possible Two Different Superconducting States of Multiorbital Superconductor  $\text{Na}_x\text{CoO}_2 \cdot y\text{H}_2\text{O}$**  MASAHITO MOCHIZUKI, RIKEN (The Institute of Physical and Chemical Research); Tokura Multiferroics Project, ERATO, JST, MASAO OGATA, Dept. of Physics, University of Tokyo — Motivated by recently reported experimental phase diagrams, we theoretically study the effects of  $\text{CoO}_6$  distortion on the electronic structure in  $\text{Na}_x\text{CoO}_2 \cdot y\text{H}_2\text{O}$  by constructing the multiorbital model. By analyzing the model, we show the deformation of band dispersions and Fermi-surface (FS) topology caused by the variation of  $\text{CoO}_2$ -layer thickness. We propose that two different pairing states, an extended  $s$ -wave and a  $p$ -wave pairings, are possible depending on the layer thickness or the FS topology. Furthermore, microscopic calculations of thermodynamic quantities show that two different specific-heat data and two distinct superfluid-density data can be explained fairly well for these two pairing states. We also discuss that inconsistent and scattered experimental results on the magnetic properties, which have been reported from NMR/NQR,  $\mu\text{SR}$  and neutron-scattering measurements, can also be clarified well if we consider the strong layer-thickness dependence.

Masahito Mochizuki  
RIKEN (The Institute of Physical and Chemical Research);  
Tokura Multiferroics Project, ERATO, JST

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