Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Unified origin for superconductivity and 3D magnetism in $\mathbf{Na}_x\mathbf{CoO}_2$ KAZUHIKO KUROKI, SHUHEI OHKUBO, HIDETOMO USUI, TAKUMI NOJIMA, The University of Electro-Communications, RYOTARO ARITA, RIKEN, SEIICHIRO ONARI, YUKIO TANAKA, Nagoya University —
The pairing mechanism of a hydrated cobaltate superconductor $Na_xCoO_2 \cdot yH_2O$ has been of great interest recently. Some experiments point toward unconventional pairing, while others suggest s-wave-like pairing. Recently, based on a fluctuation exchange study for an extended Hubbard model, we have proposed a possibility of unconventional s-wave pairing, where the nesting between the outer and the inner Fermi surfaces that arise due to the local minimum structure of the band at the Γ point plays an important role. The superconducting gap changes sign between the inner and outer Fermi surfaces due to the repulsive interaction originating from the spin fluctuations at the nesting vector, while the gap does not change sign within each Fermi surface. We have further found that this nesting becomes three dimensional when a small hopping integral in the z-direction is considered, which gives rise to an in-plane ferromagnetic, out-of-plane antiferromagnetic spin correlation, consistent with the experiments for the non-hydrated Na-rich systems. The calculated magnetic ordering temperature and the spin wave dispersion explain well the experimental results.

Kazuhiko Kuroki
The University of Electro-Communications

Date submitted: 11 Nov 2006 Electronic form version 1.4