Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

**Precise control of the Na nonstoichiometry in $Na_xCoO_2$** YOSHIHIKO OKAMOTO, ATSUSHI NISHIO, YOKO KIUCHI, ZENJI HIROI, Institute for Solid State Physics, Univ. of Tokyo — $Na_xCoO_2$ has been attracting great interests in terms of a correlation between its electronic properties and Na nonstoichiometry. Many groups have reported that a Na rich phase ($x \sim 0.7$) is a Curie-Weiss metal and a poor phase ($x \sim 0.3$) is a Pauli paramagnetic metal. The origin of this difference, however, has not been confirmed yet, mainly because of difficulty in controlling precisely the Na nonstoichiometry. We succeeded in synthesizing a series of polycrystalline samples of $Na_xCoO_2$ with well-controlled Na content by the solid-state reaction instead of the solution reaction previously used. We prepared polycrystalline $Na_xCoO_2$ ($0.58 \leq x \leq 0.63$) by a solid-state reaction of $Na_{0.71}CoO_2$ and $Na_{0.5}CoO_2$ at 200°C. Furthermore, fine tuning of Na content in the range of $0.62 < x < 0.63$ was carried out by a solid-state reaction of $Na_{0.62}CoO_2$ and $Na_{0.63}CoO_2$. Magnetic susceptibility of $Na_xCoO_2$ exhibited Curie-Weiss behavior at $x \geq 0.621$ while nearly temperature independent paramagnetism at $x \leq 0.620$. Such a drastic change of magnetism clearly indicates that the magnetic phase boundary is located in an extremely narrow range around $x = 0.62$. We think that the difference originates from a change of the Fermi surface topology with electron filling probably associated with the dip in the $a_{1g}$ band near the $\Gamma$ point.

Yoshihiko Okamoto
Institute for Solid State Physics, Univ. of Tokyo

Date submitted: 12 Dec 2007 Electronic form version 1.4