Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Transport and Thermoelectric Properties of $Ca_3Co_4O_9$ Thin Films YUFENG HU, QIANG LI, Materials Science Department, Brookhaven National Laboratory, WEIDONG SI, Physics Department, Brookhaven National Laboratory, ELI SUTTER, Center for Functional Nanomaterials, Brookhaven National Laboratory, ROBERT SABATINI, Materials Science Department, Brookhaven National Laboratory — It has been discovered recently that cobaltates have very large thermoelectric power, which shows that cobaltates hold great promise to be potential integrated heating spreading solution, such as thermal management of microprocessors. Among the cobaltates, $Ca_3Co_4O_9$ and $Ca_2Co_2O_5$ are exhibiting best thermoelectric properties. The ZT value for these calcium-cobaltates reaches as high as 2.7 at $T \geq 873$ K, which clearly challenges the best conventional thermoelectric materials found in intermetallic compounds, such as Bi_2Te_3/Sb_2Te_3 alloys. The purpose of this work is to study the transport and thermoelectric properties of $Ca_3Co_4O_9$ thin films. We have successfully grown the $Ca_3Co_4O_9$ c-axis orientated thin films using Pulsed Laser Deposition (PLD) technique on various substrates, including Si, $LaAlO_3$, Al_2O_3. The resistivity and thermoelectric power measurements show that these films have superior thermoelectric properties, similar to that found in the bulk samples. The detailed transport and thermoelectric properties of $Ca_3Co_4O_9$ thin films will be discussed. This work was supported by the U. S. Dept. of Energy, Office of Basic Energy Science, under contract No. DE-AC-02-98CH10886.

Yufeng Hu
Materials Science Department, Brookhaven National Laboratory

Date submitted: 22 Nov 2004 Electronic form version 1.4