Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Thermal conductivity of Cu/carbon nanotube composite films
JUNG JOON YOO, Korea Advanced Institute of Science and Technology, HO-KI LYEO, JAE YONG SONG, SUNGJUN LEE, Korea Research Institute of Standards and Science, JIN YU, Korea Advanced Institute of Science and Technology — We report the thermal conductivity of Cu/carbon nanotube (CNT) composite films measured by time-domain thermoreflectance, an optical pump-probe method, which measures the time-evolution of temperature change. The thermal and electrical conductivities of sputter-deposited Cu, electroplated nanocrystalline (nc) Cu, and Cu/CNT composite films are measured with a varying content ($0 \sim 2$ wt%) of CNT in Cu matrix. Both conductivities of nc-Cu films grown on a seed layer of sputtered Cu decrease significantly compared to those of bulk Cu. The thermal conductivity of Cu/CNT composite films made of nc-Cu and randomly oriented CNTs decreases further with the increase of CNT in the films. With the increasing amount of CNT, we also measure the decreasing thermal conductance of interface between Cu/CNT composite film and Al layer that is used as a transducer for the measurement. We will discuss the relations between CNT content and the measured reduction of thermal conductivity and conductance, depending upon the microstructure and impurities of composite films.

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Date submitted: 27 Nov 2007 Electronic form version 1.4