Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Quantitative analysis of nonmonotonic T_C behavior in $Nb/Co_{60}Fe_{40}$, Nb/Ni, and $Nb/Cu_{40}Ni_{60}$ bilayers JINHO KIM, JUN HYUNG KWON, YONG-JOO DOH, KOOKRIN CHAR, Center for Strongly Correlated Materials Research, School of Physics, Seoul National University, Seoul, Republic of Korea, HYEONJIN DOH, HAN-YONG CHOI, Department of Physics, Sung Kyun Kwan University, Suwon, Republic of Korea — We have studied the behavior of superconducting critical temperature T_C in $Nb/Co_{60}Fe_{40}$, Nb/Ni, and $Nb/Cu_{40}Ni_{60}$ bilayers as a function of each ferromagnetic metal thickness d_F. The T_C's of each bilayer show nonmonotonic behavior as a function of d_F with a shallow dip feature. From the quantitative analysis based on Usadel formalism [1], we observed that the T_C behavior of $Nb/Co_{60}Fe_{40}$ bilayers is in good agreement with the theoretical prediction with interface parameter $\gamma_b = R_b A/\rho_f \xi_f = 0.34$ in the whole range of d_F. On the other hand, T_C values of Nb/Ni and $Nb/Cu_{40}Ni_{60}$ bilayers are higher in the small d_F regime than the theoretical calculation with $\gamma_b = 0.7$ for Nb/Ni bilayer and $\gamma_b = 0.57$ for $Nb/Cu_{40}Ni_{60}$ bilayer, respectively, although the theoretical calculations match the dip position and the saturation value of T_C in the large d_F regime. We propose that this discrepancy is due to the weakened magnetism resulting from the structural disorder in Nb/Ni bilayer and a change in relative composition between Ni and Cu in $Cu_{40}Ni_{60}$ ferromagnetic layer at its initial nucleation on Nb film. [1] H. Doh and H. Y. Choi, cond-mat/0407149 (2004).

Jinho Kim
Center for Strongly Correlated Materials Research, School of Physics
Seoul National University, Seoul, Republic of Korea

Date submitted: 21 Mar 2013 Electronic form version 1.4