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Anomalous Proximity Effect in Nb/Al/CoFe Trilayers KOOKRIN CHAR, JUN HYUNG KWON, JINHO KIM, KYUNGMOON KIM, 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 fabricated Nb/Al/CoFe(Ni, $Cu_{40}Ni_{60}$) trilayers to study the interaction between superconductivity and ferromagnetism. Increasing the thickness of Al in S/N/F trilayer, we observed that Tc values of S/N/F trilayers increase sharply close to the Tc of S/N bilayer until the Al thickness reaches 3 nm. As Al thickness increases from 3 nm to 180 nm, Tc value of S/N/F decreases again, following those of the S/N data. In order to fit the Tc data of Nb/Al/CoFe trilayers as a function of Al thickness in a conventional Usadel formalism, we had to use a large $\gamma_b^F (= R_b A/\rho_f \xi_f)$ value of about 4, which seems unphysically large. In order to examine the role of Al/CoFe interface, we fabricated Nb/Cu(2 nm)/Al(2 nm)/CoFe and Nb/Au(2 nm)/Al(2 nm)/CoFe and compared them with Nb/Al(4 nm)/CoFe. The Tc of the double N layer system showed lower value than the Tc of the single Al layer system, although the three systems shared the same Al/CoFe interfaces. Our data suggests the large γ_b^F value in a conventional Usadel picture is not sufficient and rather indicates towards the unique role of Al instead of the Al/CoFe interface. We will discuss other possibilities such as the triplet superconductivity in order to explain our experimental findings.

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