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Study of giant proximity effect in high temperature cuprate superconductor based Josephson junctions[1] P.K. ROUT, Indian Institute of Technology Kanpur, R.K. RAKSHIT, National Physical Laboratory, New Delhi, R.C. BUDHANI, Indian Institute of Technology Kanpur and National Physical Laboratory, New Delhi — While the Josephson effect in many conventional superconductors based superconductor - normal metal - superconductor junctions can be explained in term of well-known proximity effect, a number of puzzling results have been reported for high temperature cuprate superconductor based junctions. The flow of the supercurrent in such junctions through unusually thick barriers (as thick as 100 nm) has been observed even though the superconducting coherence lengths (ξ_N) are of the order of few nm. Here, we present the results of our c-axis oriented $La_{1.85}Sr_{0.15}CuO_4$/ $La_{1.85}Sr_{0.15}Cu_{1-x}Co_xO_4$ (LSCCO)/ $La_{1.85}Sr_{0.15}CuO_4$ Josephson junctions with $x = 0.01$, 0.02 and 0.03. The temperature dependent critical current density of the junctions clearly shows the Josephson coupling even for the LSCCO thickness of 50 nm for all x. We also extract the temperature dependent ξ_N and the junction transition temperature, which is well above the superconducting transition temperature of the LSCCO. Our results point towards giant proximity effect in these compounds.

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