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Josephson Coupling in Nb/SmB_6/Nb Junctions[1] XIAOHANG ZHANG, SEUNGHUN LEE, CNAM, MSE, and Physics, University of Maryland, College Park, JASPER DRISKO, JOHN CUMINGS, MSE, University of Maryland, College Park, RICHARD GREENE, CNAM and Physics, University of Maryland, College Park, ICHIRO TAKEUCHI, CNAM, MSE, and Physics, University of Maryland, College Park — Josephson coupling of superconductors through a topological surface has attracted considerable attention because it may provide device applications of topological insulators with implications for Majorana fermions. However, the results of previous Josephson junction studies on topological insulators have not been fully understood due to complications arising from the conducting bulk and the non-pristine nature of the surfaces/interfaces of the topological insulator materials used. In this work, SmB_6 thin films with a highly insulating bulk were adopted to minimize the influence of the bulk carriers while in-situ deposition of Nb film on SmB_6 surface was used to ensure the interface quality. The bilayer structure was then patterned into Nb/SmB_6/Nb lateral junctions by e-beam lithography and ion milling. The Nb electrodes in our junctions had a typical width of ˜1 μm and the gap between the two Nb electrodes was varied from 50 nm to 200 nm. A critical current up to 40 μA has been observed in junctions with a gap around 50 nm at 2.0 K. In this talk, I will discuss the implication of our results to the desired Josephson coupling through topological surface states.

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Xiaohang Zhang
CNAM, MSE, and Physics, University of Maryland, College Park

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