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Tuning effective pairing potential through atomic scale control of superconductor heterostructures[1] CHENDONG ZHANG, Department of Physics, the University of Texas at Autsin; Institute of Physics, Chinese Academy of Sciences, JISUN KIM, JUNGDAE KIM, HYOUNGDO NAM, QIAN NIU, Department of Physics, the University of Texas at Austin, HONGJUN GAO, Institute of Physics, Chinese Academy of Sciences, CHIH-KANG SHIH, Department of Physics, the University of Texas at Austin — Previous experiments showed that superconductivity persists in ultrathin films of conventional superconductors, even in films that are only 1-2 atomic layers thick. However, it has also been implied that the interface and substrate can strongly influence the electronic properties in the quasi two-dimensional regime. In this work, we fabricated a heterostructure with a normal metal layer (Ag here) placed in between a superconducting film (Pb here) and an insulating substrate, and measured its superconductivity with scanning tunneling spectroscopy subsequently. The most striking observation is the requirement of an overlayer (L_{Pb}) to recover the superconductivity, while the recovery thickness is linearly dependent on the underlayer thickness. Considering the renormalization of pairing interaction strength for Cooper pair in the hybrid structure, the "effective attractive potential" model was developed in this work. It could serve as a model with predictive power to describe the general behavior of superconductor heterostructures. Moreover, the physical origin of some discrepancies in the reported transition temperature as a function of film thickness is partly elucidated by this work as well.

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