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Superconducting proximity effect in thin graphite films A. KANDA, T. SATO, S. TANAKA, H. GOTO, Y. OOTUKA, Inst. Phys. and TIMS, Univ. Tsukuba and JST-CREST, K. TSUKAGOSHI, RIKEN, AIST, and JST-CREST, H. MIYAZAKI, RIKEN and JST-CREST, S. ODAKA, Y. AOYAGI, RIKEN, Tokyo Inst. Tech. and JST-CREST — Gate-controlled superconducting proximity effect in thin graphite films is reported. A graphite film with thickness of 4 - 10 nm is connected to two aluminum superconducting electrodes, forming a SNS junction, and gate electric field is applied using a back gate. The critical supercurrent displays an ambipolar behavior, and for a fixed normal-state resistance the electron critical supercurrent with positive gate voltage is always larger than the hole critical supercurrent with negative gate voltage (electron-hole symmetry breaking). This effect is also observed in the critical temperature where the junction resistance vanishes. Furthermore, the critical supercurrent is proportional to $\exp(-(T/T_0)^2)$, which has never been observed in other SNS systems. The details of the experimental results as well as their possible origins will be discussed.

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