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Superconducting proximity effect in inverted InAs/GaSb quantum well structures with Ta electrodes WENLONG YU, YUXUAN JIANG, CHAO HUAN, XUNCHI CHEN, School of Physics, Georgia Institute of Technology, Atlanta, GA 30332, U.S.A., SAMUEL D. HAWKINS, JOHN F. KLEM, Sandia National Laboratories, Albuquerque, NM 87185, U.S.A., ZHIGANG JIANG, School of Physics, Georgia Institute of Technology, Atlanta, GA 30332, U.S.A., WEI PAN, Sandia National Laboratories, Albuquerque, NM 87185, U.S.A. — We report on a systematic study of the proximity effect in top-gated InAs/GaSb quantum wells in contact with a superconducting Ta electrode. We find that the electronic transport across the InAs-Ta interface exhibits distinct zero-bias behavior, either a conductance (dI/dV) peak or dip, depending on the interfacial transparency. For a relatively resistive interface, we observe a dI/dV peak at zero bias, accompanied by two dI/dV dips at high bias voltages, consistent with previous works. When a transparent InAs-Ta interface is achieved, a zero-bias dV/dI dip appears with two coherent-peak-like features forming at bias voltages corresponding to the superconducting gap of Ta. The dI/dV spectra of the transparent InAs-Ta interface at different gate voltages can be fit well using the standard BTK model and the temperature dependence follows a BCS-like behavior. Our work demonstrates the possibility of achieving the highly transparent interfaces in InAs/GaSb hybrid structures, needed for studying the intriguing Andreev bound states in this two-dimensional topological system.

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