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Topological Proximity Effects in Graphene Nanoribbon Heterostructures GUFENG ZHANG, Univ. of Sci. & Tech. of China, Fudan University, XIAOGUANG LI, Fudan University, Univ. of Sci. & Tech. of China, GUANGFEN WU, Univ. of Sci. & Tech. of China, Shenzhen Institutes of Advanced Technology, JIE WANG, DIMITRIE CULCER, Univ. of Sci. & Tech. of China, EFTHIMIOS KAXIRAS, Harvard University, ZHENYU ZHANG, Univ. of Sci. & Tech. of China, Harvard University — Topological insulators (TI) are bulk insulators that possess robust chiral conducting states along their interfaces with normal insulators. A tremendous research effort has recently been devoted to TI-based heterostructures, in which conventional proximity effects give rise to many exotic physical phenomena. Here we establish the potential existence of "topological proximity effect" at the interface of a topological graphene nanoribbon (GNR) and a normal GNR. Specifically, we show that the location of the topological edge states exhibits versatile tunability as a function of the interface orientation, as well as the strengths of the interface coupling and spin-orbit coupling in the normal GNR. For zigzag and bearded GNRs, the topological edge state can be tuned to be either at the interface or outer edge of the normal ribbon. For armchair GNR, the potential location of the topological edge state can be further enriched to be at the edge of or within the normal ribbon, at the interface, or diving into the topological GNR. We also discuss potential experimental realization of the predicted topological proximity effects, which may pave the way for integrating the salient functionality of TI and graphene in future device applications.

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