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Majorana Fermions on Zigzag Edge of Monolayer Transition Metal Dichalcogenides RUILIN CHU, University of Texas at Dallas — Majorana fermions, quantum particles with non-Abelian exchange statistics, are not only of fundamental importance, but also building blocks for fault-tolerant quantum computation. Although certain experimental breakthroughs for observing Majorana fermions have been made recently, their conclusive detection is still challenging due to the lack of proper material properties of the underlined experimental systems. Here we propose a new platform for Majorana fermions based on edge states of certain non-topological two-dimensional semiconductors with strong spin-orbit coupling, such as monolayer group-VI transition metal dichalcogenides (TMD). Using first-principles calculations and tight-binding modeling, we show that zigzag edges of monolayer TMD can host well isolated single edge band with strong spin-orbit coupling energy. Combining with proximity induced s-wave superconductivity and in-plane magnetic fields, the zigzag edge supports robust topological Majorana bound states at the edge ends, although the two-dimensional bulk itself is non-topological. Our findings points to a controllable and integrable platform for searching and manipulating Majorana fermions.

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