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CaFeAs₂: A staggered intercalation of quantum spin Hall and high-temperature superconductivity

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We predict that CaFeAs₂, a newly discovered iron-based high-temperature (T-c) superconductor, is a staggered intercalation compound that integrates topological quantum spin Hall (QSH) and superconductivity (SC). CaFeAs₂ has a structure with staggered CaAs and FeAs layers. While the FeAs layers are known to be responsible for high T-c superconductivity, we show that with spin orbital coupling each CaAs layer is a Z(2) topologically nontrivial two-dimensional QSH insulator and the bulk is a three-dimensional weak topological insulator. In the superconducting state, the edge states in the CaAs layer are natural one-dimensional topological superconductors. The staggered intercalation of QSH and SC provides us a unique opportunity to realize and explore physics, such as Majorana modes and Majorana fermion chains.

Keywords**KeyWords Plus:** TOPOLOGICAL INSULATORS; MAJORANA FERMIONS; SEMICONDUCTOR**Author Information****Reprint Address:** Wu, XX (reprint author)

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