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### **Iron-Based Superconductors as topological matter**

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We show the existence of non-trivial topological properties in Iron-based superconductors. Several examples are provided, including (1) the single layer FeSe grown on SrTiO<sub>3</sub> substrate, in which an topological insulator phase exists due to the band inversion at M point; (2) CaFeAs<sub>2</sub>, a staggered intercalation compound that integrates both quantum spin hall and superconductivity in which the nontrivial topology stems from the chain-like As layers away from FeAs layers; (3) the Fe(Te,Se) thin films in which the nontrivial Z<sub>2</sub> topological invariance originates from the parity exchange at  $\Gamma$  point that is controlled by the Te(Se) height; (4) nontrivial topology that is driven by the nematic order in FeSe. These results lay ground for integrating high T<sub>c</sub> superconductivity with topological properties to realize new emergent phenomena, such as majorana particles, in iron-based high temperature superconductors Reference: (1) NingNing Hao and Jiangping Hu, Topological phases in the Single Layer FeSe"; Phys. Rev. X 4, 031053 (2014). (2) X Wu, C Le, Y Liang, S Qin, H Fan and J. P. Hu Effect of As-chain layers in CaFeAs<sub>2</sub>" Phys. Rev. B 89 205102 (2014) (3) X. Wu, S. Qin, Y. Liang, C. Le, H. Fan, and J. Hu, CaFeAs<sub>2</sub>: a Staggered Intercalation of Quantum Spin Hall and High Temperature Superconductivity," Physics. Rev. B (Rapid Communication), 91, 081111 (2015) (4) X Wu, Y Liang and JP Hu, unpublished.