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Large-gap Quantum Spin Hall Insulators in Tin Films YONG XU, Stanford University, BINGHAI YAN, Max Planck Institute for Chemical Physics of Solids, Dresden, Germany, HAI-JUN ZHANG, JING WANG, GANG XU, Stanford University, PEIZHE TANG, WENHUI DUAN, Tsinghua University, Beijing, China, SHOU-CHENG ZHANG, Stanford University — The search of large-gap quantum spin Hall (QSH) insulators and effective approaches to tune QSH states is important for both fundamental and practical interests. Based on first-principles calculations we find two-dimensional tin films in a honeycomb lattice, which we call "Stanene" structures, are QSH insulators with sizable bulk gaps of 0.3 eV, sufficiently large for practical applications at room temperature. These QSH states can be effectively tuned by chemical functionalization and by external strain. The mechanism for the QSH effect in this system is band inversion at the Γ point, similar to the case of HgTe quantum well. Possible experimental realization of the Stanene structure will be discussed.

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