

Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Magnetic Dirac Fermions and Chern Insulator Supported on Pristine Silicon Surface HUIXIA FU, Chinese Academy of Sciences (CAS), ZHENG LIU, Tsinghua University, China, JIA-TAO SUN, SHENG MENG, Chinese Academy of Sciences (CAS) — Emergence of ferromagnetism in non-magnetic semiconductors is strongly desirable, especially in topological materials thanks to the possibility to achieve quantum anomalous Hall effect. Based on first principles calculations, we propose that for Si thin film grown on metal substrate, the pristine Si(111)- $\sqrt{3}\times\sqrt{3}$ surface with a spontaneous weak reconstruction has a strong tendency of ferromagnetism and nontrivial topological properties, characterized by spin polarized Dirac-fermion surface states. In contrast to conventional routes relying on introduction of alien charge carriers or specially patterned substrates, the spontaneous magnetic order and spin-orbit coupling on the pristine silicon surface together gives rise to quantized anomalous Hall effect with a finite Chern number $C = -1$. This work suggests exciting opportunities in silicon-based spintronics and quantum computing free from alien dopants or proximity effects.

Huixia Fu
Chinese Academy of Sciences (CAS)

Date submitted: 10 Nov 2016

Electronic form version 1.4