Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Surface Magnetism on pristine silicon thin film for spin and valley transport JIA-TAO SUN, Institute of Physics, Chinese Academy of Sciences — The spin and valley degree of freedom for an electron have received tremendous attention in condensed matters physics because of the potential application for spintronics and valleytronics. It has been widely accepted that d^0 light elemental materials of single component are not taken as ferromagnetic candidates because of the absence of odd paired electrons. The ferromagnetism has to be introduced by ferromagnetic impurity, edge functionalization, or proximity with ferromagnetic neighbors *etc*. These special surface or interface structures require atomically precise control which significantly increases experimental uncertainty and theoretical understanding. By means of density functional theory (DFT) computations, we found that the spin- and valley- polarized state can be introduced in pristine silicon thin films without any alien components. The key point to this aim is the formation of graphene-like hexagonal structures making a spin-polarized Dirac fermion with half-filling. The resulting fundamental physics such as quantum valley Hall effect (QVHE), quantum anomalous Hall effect (QAHE) and magnetoelectric effect will be discussed.

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Date submitted: 10 Nov 2016 Electronic form version 1.4