Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Intrinsic magnetism, band gap opening and optical absorption in bilayer silicene[1] XINQUAN WANG, ZHIGANG WU, Department of Physics, Colorado School of Mines, WU'S CONDENSED MATTER GROUP TEAM — It has been long sought to create magnetism out of simple non-magnetic materials like silicon. Here we show that intrinsic magnetism exists in bilayer silicene with no need to cut, etch, or dope. Unlike bilayer graphene, strong covalent interlayer bonds formed in bilayer silicene breaks the original π-bonding network of each layer, leaving the un-bonded electrons unpaired and localized to carry magnetic moments. These magnetic moments then couple ferromagnetically within each layer while antiferromagnetically across layers, giving rise to an infinite magnetic sheet with structural integrity and magnetic homogeneity. Our *ab initio* many-body calculations using the GW approach reveals that the unique magnetic ordering results in a fundamental band gap of 0.55 eV. Furthermore, we computed absorption spectrum by solving the Bethe-Salpeter equation, and our results suggest very strong absorption near the absorption edge. The integration of intrinsic magnetism and spontaneous band gap opening makes bilayer silicene attractive to future nanoelectronics as well as spin-based computation and data storage. This material could also be used as excellent light absorber, and its small band gap and one-dimensional confinement might be employed for efficient multi-exciton generation.

[1]This work was supported by a U.S. DOE Early Career Award (Grant No. DE-SC0006433).

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Date submitted: 13 Nov 2014 Electronic form version 1.4