Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Topological phase transition in hexagonal boron-nitride bilayers modulated by gate voltage[1] GUOJUN JIN, XUECHAO ZHAI, Nanjing University — We study the gate-voltage modulated electronic properties of hexagonal boron-nitride bilayers with two different stacking structures in the presence of intrinsic and Rashba spin-orbit interactions. Our analytical results show that there are striking cooperation effects arising from the spin-orbit interactions and the interlayer bias voltage. For realizing topological phase transition, in contrast to a gated graphene bilayer for increasing its energy gap, the energy gap of a boron-nitride bilayer is significantly reduced by an applied gate voltage. For the AA stacking-bilayer which has the inversion symmetry, a strong topological phase is found, and there is an interesting reentrant behavior from a normal phase to a topological phase and then to a normal phase again, characterized by the topological index. Therefore, the gate voltage modulated AA-boron nitride bilayer can be taken as a newcomer of the topological insulator family. For the AB stacking-bilayer which is lack of the inversion symmetry, it is always topologically trivial, but exhibits an unusual quantum Hall phase with four degenerate low-energy states localized at a single edge. It is suggested that these theoretical findings could be verified experimentally in the transport properties of boron-nitride bylayers.

[1]This research was supported by the NSFC (Nos. 60876065, 11074108), PAPD, and NBRPC (Nos. 2009CB929504, 2011CB922102).

Guojun Jin
Nanjing University

Date submitted: 11 Nov 2012 Electronic form version 1.4