Role of Strain for Manipulating Valley-Isospin in Graphene Nanoribbons

Nojoon Myoung*[1] and Hee Chul Park[1]

[1]Institute for Basic Science (IBS) – South Korea

Abstract

For graphene nanoribbons, the quantum Hall conductance across a p-n junction is characterized by an angle between valley-isospins on each edge. The valley-isospin in graphene nanoribbons is clearly described in Bloch sphere: valley-polarized isospin for zigzag edges and valley-mixing isospin for armchair graphene nanoribbons. In particular, armchair grarphene nanoribbons exhibits three-fold quantum Hall conductance according to geometric phases which are determined by their electronic states (metallic or semiconducting). In this study, we demostrate that local strain in armchair graphene nanoribbons affects the valley-isospin dependence of the quantum Hall conductance across a p-n junction, by causing a rotation of the valley-isospin in Bloch sphere. Moreover, the manipulation of the valley-isospin exhibits a depenence on how the local strain is oriented with respect to the p-n junction interface. We also examine effects of the strain-induced localized states on the quantum Hall conductance, resulting in Fano-type resonances with a possibility of having spin-polarized transport.

*Speaker