Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Curvature-induced spin-orbit coupling and spin relaxation in a chmically-clean single-layer graphene[1] JAE-SEUNG JEONG, School of Physics, Korea Institute for Advanced Study, Seoul 130-722, Korea, JEONGKYU SHIN, HYUN-WOO LEE, Department of Physics and PCTP, Pohang University of Science and Technology, Pohang 790-784, Korea — Based on the second-order perturbation theory, we show that curvature induced by corrugations or periodic ripples in single-layer graphenes generates two types of effective spin-orbit coupling. In addition to the spin-orbit coupling reported previously that couples with sublattice pseudospin and corresponds to the Rashba-type spin-orbit coupling, there is an additional spin-orbit coupling that does not couple with the pseudospin. The additional spin-orbit coupling depends on the direction of principal curvature, which is similar with the curvature-induced spin-orbit coupling of carbon nanotubes that depends on the chiral angle. However, the spin-orbit coupling of single-layer graphenes can not be obtained from the trivial extension of the spin-orbit coupling of carbon nanotubes owing to their distinct topological structure. Via the numerical calcualtion, we show that both types of the curvature-induced spin-orbit coupling make the same order of contribution to spin relaxation in chemically-clean single-layer graphene with nanoscale corrugation. The spin relaxation dependence on the corrugation roughness is also investigated.

[1]This work was financially supported by the NRF (2010-0014109) and BK21.

Jae-Seung Jeong
School of Physics, Korea Institute for Advanced Study, Seoul 130-722, Korea

Date submitted: 08 Nov 2011 Electronic form version 1.4