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Gate dependent non-local spin resistance in an Au-patched graphene. JUNGMIN PARK, HYUNGDUK YUN, MI-JIN JIN, JUNHYEON JO, INSEON OH, VIJAYAKUMAR MODEPALLI, SOON-YONG KWON, JUNG-WOO YOO[1], School of Materials Science and Engineering -Low dimensional Carbon Materials Center, Ulsan National Institute of Science and Technology — Enhanced spin-orbit coupling in grapheme can induce spin Hall effect, which can be adapted to electrically generate or detect a spin current in the spin logic device without a ferromagnet. Recently, spin Hall effect in decorated graphenes has been experimentally observed by non-local transport studies. However, results on the non-local measurements in graphene hall bar devices exploiting spin Hall effect have been under controversy. In this study, we introduced an ultra-thin Au-patch on a graphene surface to enhance the spin-orbit coupling, and employed an H-bar type device to probe the nonlocal spin signal induced by spin Hall effect. The geometry of the studied H-bar devices has channels of 1 μm width and 5.6 μm length. An ultra-thin Au patch (˜1 nm) was deposited by a thermal evaporation. And in-plane field dependent spin precession signature can be observed at particular gate voltage. At that point, the spin hall angle and the spin relaxation length of the Au-patch graphene device were γ ˜8.8 % and λs ˜2.2 μm at 2 K, respectively. The estimated spin relaxation rates were proportional to square of temperature, suggesting an Elliott-Yafet spin relaxation mechanism.

[1]corresponding author

Jungmin Park
Ulsan National Institute of Science and Technology

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