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Abstract

Vertical Magnetic Spin Valve Junction with MoSe2 and its Hybrid Structures with Graphene

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Abstract:

Determination and arrangement of non-magnetic spacers in vertical magnetic spin valves are of critically importance for high efficient spintronic devices. Two-dimensional (2D) layers and their hybrid structures have opened up a new avenue for next-generation spintronic applications, benefited by their unique electronic properties as well as high crystallinity with an atomically flat surface. Here, we report magneto-resistance measurements from the vertical spin-valve devices with a single-layer (SL), multi-layer (ML) MoSe2 and its hybrid structures with graphene as non-magnetic spacers. We employ elegant technique to make ultraclean ferromagnetic/non-magnetic/ferromagnetic interfaces to elucidate intrinsic spin-transferring mechanisms through both an individual and multilayer stacks of 2D layered materials. We observe spin polarizations of the spin-valve devices with bi-layer graphene and SL-MoSe2 do not reverse their polarity before annealing, resulting in a positive magnetoresistance ratio. In contrast, the spin-valve devices with the hybrid junctions of SL-MoSe2/bi-layer graphene show the reversal of spin polarizations after annealing. Moreover, FLG/ML-MoSe2/FLG demonstrate positive MR before and after annealing. Our observations suggest that the microscopic spintransferring mechanisms not only depends upon the interface between ferromagnetic metal and 2D materials but also band splitting of bi-layer graphene due to proximityinduced effect which play significant role in spin-transferring phenomena at the vertical magnetic spin-valve devices.

Biography:

Muhammad Farooq Khan has completed his PhD in Feb 2018 at the age of 32 years from Sejong University, Seoul, Korea and postdoctoral studies from School of Mechanical Engineering Yonsei University, Seoul Korea. He has published more than 45 papers in reputed journals and recently serving as Asisstant Professor in Department of Electrical Engineering, Sejong University, South Korea.

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