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Electrical spin injection into graphene through hexagonal boron nitride tunnel barrier TAKEHIRO YAMAGUCHI, YOSHIHISA INOUE, SATORU MASUBUCHI, SEI MORIKAWA, MASAHIRO ONUKI, Institute of Industrial Science, University of Tokyo, KENJI WATANABE, TAKASHI TANIGUCHI, National Institute for Materials Science, RAI MORIYA, TOMOKI MACHIDA, Institute of Industrial Science, University of Tokyo — Two-dimensional crystals such as graphene, h-BN, and transition metal dichalcogenides are emergent material system and receiving much attention for spintronics applications. Particularly, these 2D crystals have significant advantages when they are used as a tunnel barrier. 1) These materials can be exfoliated with a monolayer thick resolution. 2) A single-crystalline flake can be fabricated. 3) A wide range of band gaps are available. However, up to now, spin polarized tunneling through these materials has not been fully explored experimentally. Here, we demonstrate spin polarized tunneling through one monolayer thick of hexagonal boron nitride (h-BN) layer and used it for electrical spin injection into graphene [1]. A NiFe/ML h-BN/bilayer graphene/h-BN structure is fabricated using a micromechanical cleavage and dry transfer technique. I-V curve across h-BN exhibits non-linear characteristics and suggests the successful fabrication of tunnel barrier. A spin signal is observed in non-local magnetoresistance measurement. Spin diffusion constant and spin relaxation time are obtained from the Hanle measurement.

[1] T. Yamaguchi, Y. Inoue, et al., Applied Physics Express 6, 073001 (2013).

Takehiro Yamaguchi
Institute of Industrial Science, University of Tokyo

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