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Spin-filter tunneling in a magnetic tunnel junction from first-principles

Abstract
The effective realization of spin-polarized currents is the fundamental key in a magnetic tunnel junction (MTJ). Since the recent discovery of 2-dimensional (2D) magnetic materials, the giant tunneling magnetoresistance with 2D magnetic materials in spin-filter MTJs has been attention [1]. In general, the spin-filter MTJs consist of magnetic multilayers such as the ferromagnetic (FM) metal/FM insulator/FM metal structures. Thus, in spin-filter MTJs, both the potential-barrier tunneling and spin-filter tunneling become important. Although some experimental studies on the spin-filter MTJs with 2D magnetic materials have been performed [1], first-principles theoretical works have been rarely reported. Meanwhile, the ferromagnetic metal Fe_3GeTe_2 has attention due to the high Curie temperature of 220 K [2,3,4]. Therefore, we investigate the spin-filter tunneling effect through the various 2D magnetic potential barriers in the structure composed of FM metal Fe_3GeTe_2/2D FM insulator/FM metal Fe_3GeTe_2 by the first-principles transport calculations.

References

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