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Introducing 2D Materials for Magnetic Tunnel Junctions

The recent discovery of graphene, and other 2D materials, has opened novel exciting opportunities in terms of functionalities and performances for spintronics devices. While to date, it is mainly graphene properties for efficient spin transport which have been put forward, we will present here experimental results on another avenue for 2D materials in spintronics. We will show that a thin graphene passivation layer, directly integrated by low temperature catalyzed chemical vapor deposition (CVD), can prevent the oxidation of a ferromagnet [1]. This in turn enables the use of novel humid/ambient low-cost processes for spintronics devices, which would usually lead to oxidation during the fabrication and thus a quenching of the spintronic performances. We will illustrate this property by demonstrating the use of ozone based ALD processes to fabricate efficient spin valves protected with graphene [2]. Importantly, the use of graphene on ferromagnets allows to preserve a highly surface sensitive spin current polarizer/analyzer behavior and adds new enhanced spin filtering property [1][2]. Furthermore, we will present results concerning another 2D material isomorph to graphene: the atomically thin insulator hexagonal boron nitride (h-BN). Characterizations of complete spin valves making use of monolayer h-BN tunnel barriers grown by CVD will be presented [3]. These different experiments unveil promising uses of 2D materials for spintronics [4].

References

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