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**Spin transport in epitaxial graphene**

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Spintronics is a paradigm focusing on spin as the information vector in fast and ultra-low-power non volatile devices such as the new STT-MRAM. Beyond its widely distributed application in data storage it aims at providing more complex architectures and a powerful beyond CMOS solution for information processing. The recent discovery of graphene has opened novel exciting opportunities in terms of functionalities and performances for spintronics devices. We will present experimental results allowing us to assess the potential of graphene for spintronics. We will show that unprecedented highly efficient spin information transport can occur in epitaxial graphene leading to large spin signals and macroscopic spin diffusion lengths ($\sim$ 100 microns), a key enabler for the advent of envisioned beyond-CMOS spin-based logic architectures. We will also show that how the device behavior is well explained within the framework of the Valet-Fert drift-diffusion equations [1]. Furthermore, we will show that a thin graphene passivation layer can prevent the oxidation of a ferromagnet, enabling its use in novel humide/ambient low-cost processes for spintronics devices, while keeping its highly surface sensitive spin current polarizer/analyzer behavior and adding new enhanced spin filtering property [2]. These different experiments unveil promising uses of graphene for spintronics.

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[1] B. Dlubak et al., Nature Physics 8, 557 (2012); P. Seneor, et al., MRS Bulletin 37, 1245 (2012).
[2] B. Dlubak et al., ACS Nano 6, 10930 (2012); R. Weatherup, et al., ACS Nano 6, 9996 (2012)