Detection of the inverse spin Hall effect in Pt using graphene-based lateral spin valves

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Abstract

Graphene is a promising material for Spintronics due to its tuneable spin-transport properties and expected long spin-diffusion lengths. In the last decade, many studies have been conducted, allowing the fast development of the field. Advances includes efficient spin injection, detection and the study of the intrinsic spin relaxation mechanisms [1,2,3]. In particular, the origin of the spin relaxation in graphene has generated a heated debate, since the experimentally obtained spin lifetimes are much smaller than those predicted by standard theories, leading to the proposition of different approaches and new mechanisms to explain such behaviour [1,4].

Here, we show measurements of the inverse spin Hall effect (SHE) in Pt using graphene as spin channel. In these measurements, the spin current is injected into the channel by an electrical current passing through Co/graphene interface. The spin current, precessing within the channel due to an external magnetic field, is then detected by means of the inverse SHE in Pt. The transport parameters extracted from this approach are similar those obtained by conventional Hanle measurements. It provides another powerful method to study the transport properties and relaxation mechanisms in graphene by combining spin precession and SHE detection without the use of ferromagnets.

References

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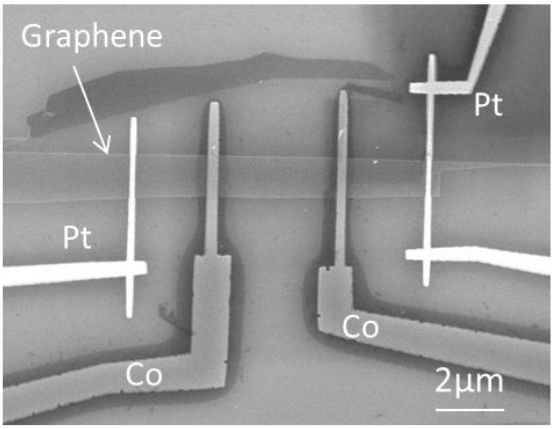
[4] Van Tuan, D. *et al*. *Nature Physics*, 10, (2014,)857-863

Figures



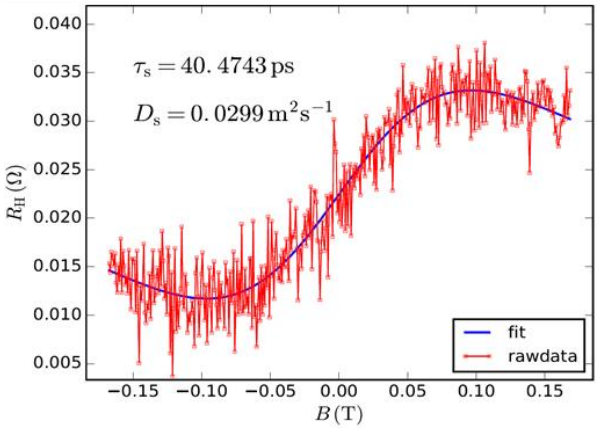


Figure: *(a) Scanning electron micrograph of a typical device. (b) Inverse spin Hall Effect signal obtained at room temperature and Vg=0.*