Electrical characterisation of the spin Hall effect in chemical vapor deposition graphene/Pt heterostructures

Williams Savero Torres[1]
L. A. Benitez[1,2], J.F. Sierra[1], M.V. Costache[1] and S.O. Valenzuela[1,3]
[1]Catalan Institute of Nanoscience and Nanotechnology (ICN2), CSIC and The Barcelone Institutte of Science and technology (BIST), Barcelone, Spain. [2]Universidad Autonoma de Barcelona, Barcelone, Spain. [3] Institucio Catalana de recerca i Estudis Avancats (ICREA), Barcelone, Spain

williams.savero-torres@neel.cnrs.fr

Spin-orbit phenomena driven by the spin Hall (SH) and spin galvanic (SG) effects provide a versatile tool for electric manipulation of spin properties in nanostructures [1,2]. The SH effect has been extensively studied in metallic systems possessing large spin-orbit coupling, demonstrating its potential for spin-logics operations without ferromagnets [1,3]. More recently SH and SG effects have been electrically characterised in two dimensional graphene-based devices, showing an unprecedented electrical gating control at room temperature. [4]

In this work, we fabricate high quality graphene/Pt spin devices to study the SH using large scale graphene growth by chemical vapor deposition. By using a carefully designed device, we characterise spin properties and extract precisely the spin Hall angle (SHA) in our devices at room temperature. Remarkably, we obtain large SHAs, arising from the good spin transport properties in our devices. Our findings provide an efficient and systematic approach to characterise SH phenomena in two dimensional heterostructrures.

References

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