Room temperature spin Hall effect in CVD graphene/Pt heterostructures

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Spin to charge interconversion driven by the spin Hall (SH) and spin galvanic effects have emerged as promising phenomena for spin-logic operations without ferromagnets [1]. The SH effect has been studied in metals, possessing large spin-orbit coupling like Pt and more recently in graphene-based devices, showing an unprecedented electrical gating control at room temperature [2,3]. These results provide the building blocks for efficient spin manipulation using spin Hall phenomena in van der Waals heterostructures and pave the way towards development of ultra- compact memory devices.

In this work, we use high quality CVD graphene/Pt heterostructures, exhibiting large signals to study the spin Hall effect [4]. By using a carefully designed device, we characterise spin transport properties and extract precisely the spin Hall angle (SHA) at room temperature. Remarkably, we obtain large SHAs with a lower limit of 0.2, which stems from the good spin properties and interface quality in our devices. Our findings provide an efficient and systematic approach to characterise spin Hall phenomena in two dimensional devices.

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