Engineering van der Waals heterostructures for spintronics

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In recent years, spin-based technologies, in which information is carried by spin instead of charge, have become promising for “beyond-CMOS” devices. Graphene and other two dimensional materials have rapidly established themselves as intriguing building blocks for spintronics applications. Owing to graphene intrinsic low spin-orbit interaction, spins can flow snugly through its crystal lattice over long distances resulting in an ideal spin channel but, at the same time, making it difficult to manipulate spins, which is the cornerstone for successfully implementing spin-based devices. In this talk a series of experiments where we study spin transport and relaxation mechanisms in graphene based van der Waals heterostructures will be presented [1,2]. It will be demonstrated how proximity-induced spin-orbit interaction in graphene --imprinted by an adjacent semiconducting transition metal dichalcogenide such as WS_2-- results in anisotropic spin dynamics. Besides, it will be shown how the enhancement of spin-orbit interaction in graphene can be utilized for room temperature spin-to charge conversion driven by both the spin Hall and the spin galvanic effect on these layered systems [3].

REFERENCES

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