Spin relaxation anisotropy in graphene/TMD structures

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Abstract

Since first exfoliation of graphene in 2004, it's spintronics applications, as well as the ones of other 2D related materials has been of high interest. One way to manipulate these spins is via the proximity effect with a TMDC that induces a strong SOC. The spin relaxation time and anisotropy are predicted by the Dyakonov-Perel mechanism being 1/2. Motivated by the discovery of a giant spin lifetime anisotropy for these systems with the presence of intervalley scattering due to the spin-valley locking, our purpose is trying to understand the mechanism that can lead to different enormous values of this anisotropy and could serve as both: an experimental proof for the existence of strong spin valley coupling in graphene-TMDCs heterostructures, and lead us to understand it as a platform for spin manipulation in graphene. We review the main results of **[1]** where spin relaxation anisotropy and time are studied both with and without intervalley scattering. We also present new results about proximity effects in multilayer compounds.

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References

[1] Cummings AW, Garcia JH, Fabian J, Roche S. Phys Rev Lett. 2017 Nov 17;119(20):206601.

Figures

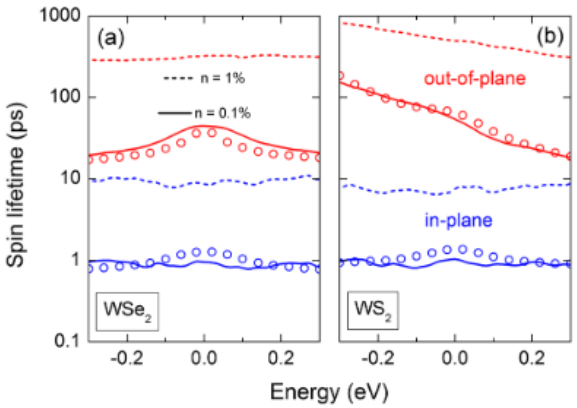

Figure 1: Spin lifetime with strong intervalley scattering for graphene on (a) WSe2 and (b) WS2. The red (blue) lines are for out-of-plane (in-plane) spin lifetime. Solid (dashe