**Spin phenomena in two dimensional materials**

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Two dimensional materials, such as graphene, transition metal dichalcogenides, or black phosphorous, offer immense opportunities for electronics and spintronics [1]. Being ultimately thin these materials could make the thinnest diodes and transistors, or the thinnest magnetic sensors and read heads. Being essentially a surface, they are also susceptible to adatoms and admolecules which can induce magnetic moments and giant spin-orbit coupling [2]. This is in fact a great opportunity, allowing us to decorate (functionalize) graphene and like materials with specific defects to make desired properties. I will review the essential spin physics of novel two dimensional materials, including spin-orbit coupling and magnetic moments, and discuss the ramifications of functionalization for spin transport experiments. Most of the results are obtained by performing computationally demanding density functional calculations on large atomic supercells, necessary to study the physics in the dilute defect limit. These calculations show a nice agreement with experiments [3], but also make authoritative predictions for future but realistic charge and spin based devices. I acknowledge support from DFG SFB 689, GRK 1570, and European Union Seventh Framework Programme under Grant Agreement No. 604391 Graphene Flagship.

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