

# Signatures of Proximity-Induced Magnetism and Spin-orbit Coupling in Graphene/ $V_xW_{1-x}Se_2$ Heterostructure

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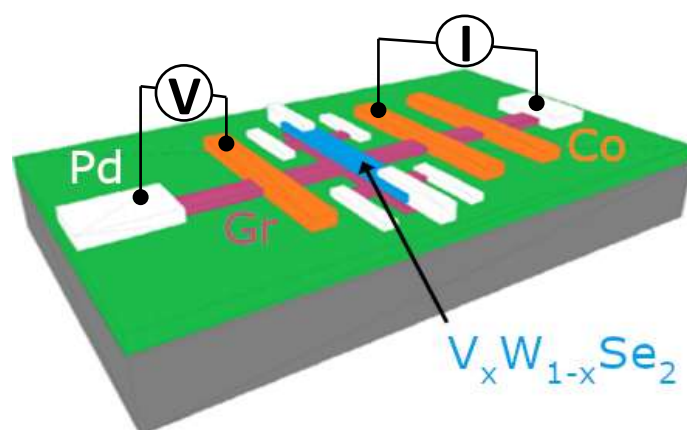
Graphene has shown great potential as an elementary building block of future spintronic devices. Its high carrier mobility and intrinsically low spin-orbit coupling (SOC) lead to long spin diffusion length, making graphene an ideal spin-channel material. Moreover, its atomic thickness promotes proximity-induced effects that provide new ways to control spin transport [1]. For instance, graphene in contact with semiconducting transition metal dichalcogenides (e. g.  $WSe_2$ ) develops a proximity SOC and a complex spin texture. Such a modification results in anisotropic spin relaxation [2] and allows to efficiently interconvert charge and spin-currents [1,3,4]. Alternatively, interfacing graphene with magnetic materials induces exchange splitting [5], possibly allowing gate-tuneable spin-polarized currents. Doping TMDCs with magnetic atoms has been reported to induce long-range magnetism up to room temperature. For example,  $V_xW_{1-x}Se_2$  shows (anti-)ferromagnetic behaviour depending on the doping level [6]. By performing nonlocal spin precession measurements, we observe signatures of magnetism together with proximity-induced SOC in graphene/ $V_xW_{1-x}Se_2$  heterostructure and investigate the interplay of these two effects.

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## References

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## Figures



**Figure 1:** Schematic of lateral spin valve device composed of graphene (Gr)/ $V_xW_{1-x}Se_2$  heterostructure and spin-sensitive ferromagnetic (Co) electrodes and non-magnetic (Pd) electrodes on  $SiO_2/Si$  substrate allowing global electrostatic gating.