Charge and spin transport through large spin-orbit coupling 2D materials

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Two dimensional (2D) materials are fascinating for the novel physics they provide. Their unique electrical, optical and mechanical properties offer a huge panel of applications. In particular, recently discovered transition metal dichalcogenides (TMDs) exhibit a ware particularly promising [1].

Tungsten diselenide (WSe₂), a representative TMD, is a semiconductor characterized by a large spin-orbit coupling making it an interesting material for spin transport and valley physics. With its electronic properties, WSe₂ is a good candidate for field effect transistors (FET) with high ON/OFF ratio. However, these FET are very dependent on the quality of the metal-semiconductor contacts. In fact, between the metal and the TMD, a large contact resistance induced by a Schottky barrier created on the interface, prevents from having high performance FET [2][3].

To clarify this link, we show both the gate voltage and the temperature dependence of the contact resistance leading to Schottky barrier height modulation. We also show WSe₂ based heterostructures fabricated for spintronics measurements.

References


Figures

Figure 1: Three-dimensional atomic force image of a final device with four Ti (5 nm)/Au (95) electrodes.

Figure 2: WSe₂ based heterostructures for spintronics.