Spin-charge interconversion in Topological insulator Sb_2Te_3

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Topological insulators (TIs) were strongly investigated in the last years in spintronics due to their large spin-orbit coupling that allows the onset on topological properties such as in Sb_2Te_3. This permits to obtain large spin-charge interconversion efficiencies. Furthermore, a big advantage of Sb_2Te_3 is the possibility of being deposited on a large-scale using magnetron sputtering. The combination of a good spin-to-charge interconversion efficiency and large resistivity makes TIs a good alternative to heavy metals to realize the read-out block of the MESO device [1]. The final goal is to achieve the 100 mV output necessary for spin-logic application. Alternatively, the inverse effect (charge-to-spin interconversion) can be useful in SOT applications.
There are mainly two ways of increasing the spin-charge interconversion output signal. By scaling device dimensions [2] and through the optimization of the spin injection [3]. Up to now, all these studies have been done in heavy metals. Our work instead focuses on applying these results to our magnetron sputtered TI. One of the biggest difficulties for their use is being able to nanopattern them without altering their physical properties, and to control the origin of the measured signal.
We will present the all-electrical measurement of the spin to charge interconversion in large-scale grown Sb_2Te_3 using nanodevices, which correspond to the read-out block of the spin-logic devices.

References

[1] Manipatruni, S. et al., Nature, 565 (2019) 35-42
[2] Pham, V.T. et al., Nat. Electron., 3 (2020) 309-315
[3] Pham, V.T. et al., Phys. Rev. B, 103 (2021) L201403

Figures

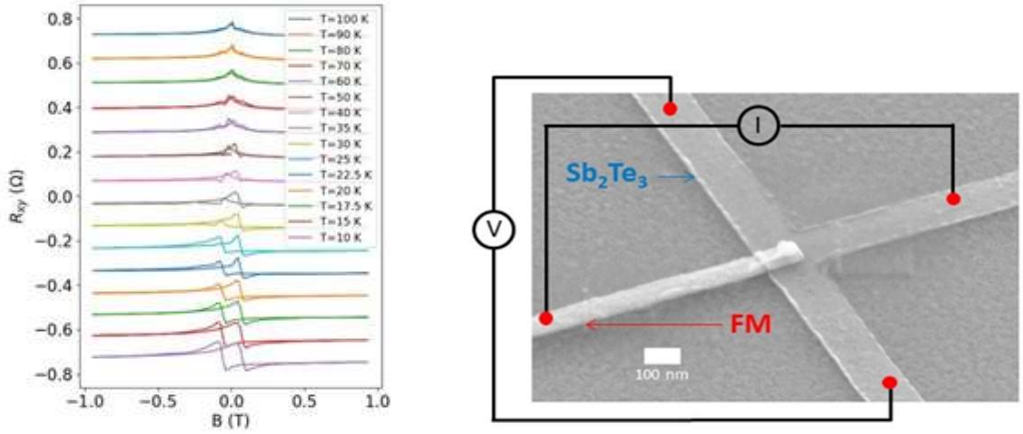

Figure 1: Left: Temperature dependence of the interconversion signal on Sb2Te3. Right: Nano patterned devices used for the measurement of the interconversion.