Designer van der Waals Heterostructures by proximity phenomena

Sergio O. Valenzuela[1,2]

1 Institució Catalana de Recerca i Estudis Avançats (ICREA), Barcelona, Spain
2 Catalan Institute of Nanoscience and Nanotechnology ICN2, CSIC and the Barcelona Institute of Science and Technology (BIST), Bellaterra, 08193 Barcelona, Spain

SOV@icrea.cat

The atomically thin nature of 2D materials promotes the design of van der Waals heterostructures by proximity effects, which originate from short-range interactions [1]. This designer approach is particularly compelling for spintronics, devices, which usually harness their functionalities from thin layers of magnetic and non-magnetic materials and the interfaces between them [2] (Figure 1). In this talk, I will introduce our approach to discern proximity effects by means of spin transport dynamics, as reflected in spin relaxation anisotropy [3] and charge to spin interconversion [4]. I will also discuss the relevance of crystal symmetry and how low symmetry systems can result in unconventional charge to spin conversion components [4].

References

[1] J. F. Sierra *et al*., Nature Nano. **16**, 856–868 (2021)
[2] H. Yang, S O. Valenzuela *et al*., Nature (2022)
[3] L. A. Benítez *et al*., Nature Phys. **14** (2018); APL Materials **7**, 120701 (2019)
[4] L. A. Benítez *et al*., Nature Mater. **19**, 170 (2020)
[5] L. Camosi *et al.*, 2D Mater. (2022) https://doi.org/10.1088/2053-1583/ac6fec

Figures

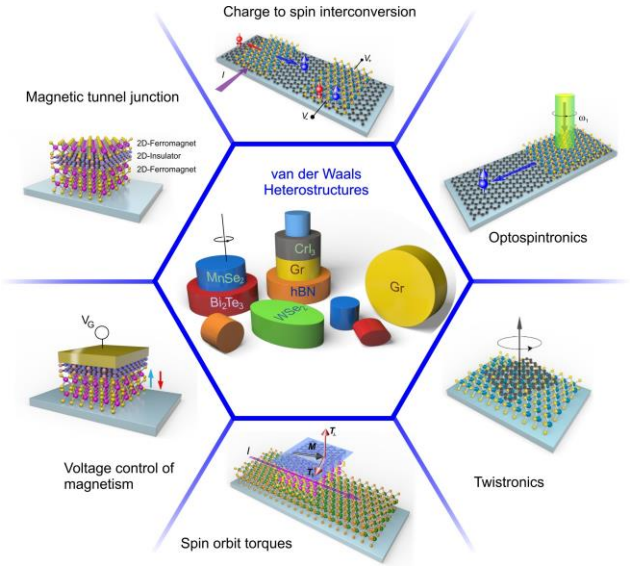

Figure 1: Spintronic devices can gain desired functionalities by stacking selected 2D materials and by proximity effects