Contribution ID: **95** Type: **Poster**

Sputtered topological insulators for Spinorbitronics logic devices

Friday 24 September 2021 09:25 (5 minutes)

Spintronics has seen remarkable progress in the last decades. By combining well known concepts like Giant and Tunneling magnetoresistance with spin torques and control of domain walls, developments are foreseen in data storage [1] and logic, with new devices like the magnetoelectric spin-orbit MESO logic device [2]. New materials and nanostructures have also allowed several breakthroughs, from 2D materials to Topological Insulators.
Topological Insulators (TI) are a peculiar category of materials. Having been experimentally discovered only in 2007 [3], they have already shown great promise for a wide range of applications. Due to their performance in the control and switch of nanomagnets based on the Spin Orbit Torque (SOT), they could lead the advancements of new memory and logic devices.
One family of materials that has arisen within TIs is the Bi2Se3 family of semiconductors. They host a metallic state on their surface while having an insulating bulk. The metallic state is protected by time reversal symmetry and presents a spin texture. Moreover, due to their strong spin orbit coupling, high values of the Spin Hall angle θSH have been reported [4], leading to outstanding control of nanomagnets. Sb2Te3 is one of the members of this family, with the TI surface state being theorized in 2009 [5] and later observed [6]. However, it has not been widely studied due to its smaller band gap. Thus, it is not yet clear if it is a material of interest for SOT applications.
In this presentation, ion beam sputtered thin films of Sb2Te3 with thicknesses ranging from 35 to 200 nm are going to be explored. Their transport properties will be presented and discussed. By correlating the magnetoconductance and thermoelectric properties of the sputtered Sb2Te3 thin films, the exotic conduction of these materials will be untangled. Following the characterisation of these TI thin films, bilayers with magnetic permalloy thin films were produced and the current spin to charge conversion studies will be addressed. As the thin films have been made using a scalable inexpensive fabrication method, already employed in the industry, these results shine light into a novel topological insulator, with promising opportunities for future applications in spintronics.

References
[1] Grimaldi, E., et al., Nature Nanotechnology 15(2), 111-117 (2020).
[2] Manipatruni, S., et al., Nature 565(7737), 35-42 (2019).
[3] König, M., et al., Science 318(5851), 766 (2007).
[4] Wang, Y., et al., Nature Communications 8(1), 1364 (2017).
[5] Zhang, H., et al., Nature Physics 5(6), 438-442 (2009)
[6] Hsieh, D., et al., Physical Review Letters 103(14),146401 (2009).

Scientific Area

Author: SOARES FERREIRA NUNES TEIXEIRA, Sofia Luisa (IFIMUP)

Co-authors: PIRES, Ana (IFIMUP); JOÃO P. ARAÚJO (IFIMUP - Instituto de Física dos Materiais); PEREIRA., André M. (IFIMUP - Institute of Physics for Advanced Materials, Nanotechnology and Photonics, Departamento de Fisica e Astronomia, Faculdade de ciências da Universidade do Porto, Portugal)

Presenter: SOARES FERREIRA NUNES TEIXEIRA, Sofia Luisa (IFIMUP)

Session Classification: Quantum Materials and Quantum Technologies (Posters)

Track Classification: Quantum Materials and Quantum Technologies