INTERNSHIP PROPOSAL

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Thesis possibility after internship: YES
Funding: YES If YES, which type of funding: ANR

Spin dependent thermoelectricity in topological materials

Keywords: thermoelectricity, topological semimetals, 2D materials

You will investigate the magneto-thermoelectric properties of magnetic and non-magnetic topological materials (such as topological insulators and Weyl semimetals) and the reciprocal interaction between thermoelectricity and spin physics. The search for new, efficient, and integrable thermoelectric (TE) compounds is an active area of research, driven by the advantages of converting heat waste into energy, powering autonomous devices or cooling electronic chips. While the most common and efficient TE materials currently in use are non-magnetic topological materials (TM) like Bi_2Se_3 and Bi_2Te_3, we plan to build on recent discoveries which showed enhanced Nernst and Seebeck effects in magnetic TM, with a large contribution induced by spin-related processes. We will particularly consider ferromagnetic compounds able to evidence large anomalous Nernst or Seebeck effects.

Single-crystals of magnetic TM such as $Bi_{1-x}Cr_xTe_3$, Cr-doped WTe_2, $MnSb_2Te_4$… will be grown by chemical vapor transport. Their magnetic and TE properties will be measured down to low temperature to determine the relationship between transport and spin physics. We aim to gain a deeper understanding of the spin-related mechanisms, in order to identify and synthesize new materials with enhanced magneto-thermoelectric properties.

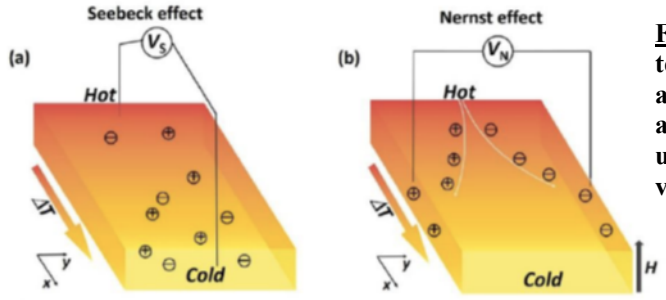

Figure 1: Thermoelectric effects induced by a temperature gradient ΔT applied to a material along the *x*-axis. (a) Seebeck effect: a voltage V_S appears along the ΔT axis. (b) Nernst effect: under a perpendicular magnetic field H, a voltage V_N appears, perpendicular to H and ΔT.

Please, indicate which speciality(ies) seem(s) to be more adapted to the subject:

Condensed Matter Physics: YES Soft Matter and Biological Physics: NO
Quantum Physics: YES Theoretical Physics: NO