



**S N BOSE NATIONAL CENTRE
FOR BASIC SCIENCES**

Block JD, Sector III, Salt Lake, Kolkata 700 106

DEPARTMENTAL SEMINAR

Condensed Matter and Materials Physics

21st December, 2022

4.00 PM

ONLINE/ FERMION

SPEAKER

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TITLE OF THE TALK

Ab-initio spin torque and spin-pumping in spin-orbit-proximitized antiferromagnets

ABSTRACT

Antiferromagnets (AFs) are attractive candidates for future spintronic applications focusing on the electrical and optical control of the antiferromagnetic order parameter. The multilayer heterostructures composed of an ultrathin magnetic and a nonmagnetic material hosting strong spin-orbit coupling (SOC) are a principal resource for spin-orbit torque (SOT) and spin-to-charge conversion effects in next generation spintronics. On the other hand, the spin pumping is a ubiquitous phenomenon in spintronic devices where magnetization dynamics generates pure spin current even in the absence of any applied bias voltage. In this talk, I will show how I have developed a first-principle based quantum transport formalism [1], which combine nonequilibrium Green functions with noncollinear density functional theory (ncDFT+NEGF) to describe the figure of merit for spin torque and spin-pumping. In particular, I will apply the first-principle based methodology to describe the SOT and spin-pumping SOT in realistic materials heterostructure, e.g. bilayer-CrI₃/monolayer-TaSe₂ vdW heterostructure [2] and Pt/MnF₂/Cu heterostructures [3].

References

- [1] B. K. Nikolic, K. Dolui, M. Petrović, P. Plecháč, T. Markussen, K. Stokbro, arXiv:1801.05793.
- [2] K. Dolui, M. D. Petrović, K. Zollner, P. Plecháč, J. Fabian, and B. K. Nikolić, Nano Lett. 20, 2288 (2020).
- [3] K. Dolui, A. Suresh, and B. K. Nikolić, J. Phys. Mater. 5, 034002 (2022).

HOST FACULTY

Dr. Thirupathiah Setti , Associate Professor
