Interfacial control of magnetic interactions in 2D magnets

Suvodeep Paul[a]
Devesh Negi[a], Saswata Talukdar[a], Saheb Karak[a], Bommareddy Poojitha[a], Manasi Mandal[a], Sourav Marik[a], R. P. Singh[a], Luminita Harnagea[b], Nashra Pistawala[b], Surjeet Singh[b], Aksa Thomas[c], Ajay Soni[c], Subhro Bhattacharjee[d], and Surajit Saha[a]
a. Dept. of Physics, Indian Institute of Science Education and Research Bhopal, MP, India
b. Dept. of Physics, Indian Institute of Science Education and Research Pune, Maharashtra, India
c. School of Physical Sciences, Indian Institute of Technology Mandi, HP, India
d. International Centre for Theoretical Sciences, Tata Institute of Fundamental Research, Bangalore, India
suvodeep17@iiserb.ac.in

Abstract

The interfaces between magnetic and non-magnetic materials provide an excellent platform for the exploration of exciting physics involving the interplay of the charge, spin, orbital, and lattice degrees of freedom with potential for a wide range of applications[1]. The discovery of various two-dimensional layered materials has allowed the integration of various magnetic and non-magnetic materials by preparing suitable van der Waals heterostructures. Transition metal phosphorus trisulphides (MPS_3, M = Mn, Fe, and Ni)[2] are a class of layered magnetic materials which retain their antiferromagnetic (AFM) ground states down to ultrathin thicknesses, maintaining a nearly thickness-insensitive ordering temperature[3]. In a series of experiments performed on various flakes of MPS_3 compounds, we have demonstrated some effective ways of tailoring the magnetic ground states of these materials by means of heterostructure engineering. The interfacial interactions which control the magnetic properties of these 2D magnetic materials show a strong dependence on the spin-dimensionality associated with the magnetic layer. In my presentation, I will discuss about the possibility to control the magnetic ground states in MPS_3 compounds (and possibly other 2D magnets) by tailoring the interfacial interactions induced by appropriate heterostructure engineering. Our findings can potentially have tremendous impact on the new generation technologies like spintronics and spin-orbitronics.

References

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