Kaixuan Zhang

Youjin Lee, Junghyun Kim, Inho Hwang, Suhan Son, and Je-Geun Park

Center for Correlated Electron Systems, Institute for Basic Science, and

Department of Physics and Astronomy, Seoul National University, Seoul 08826, Republic of Korea

Email: kxzhang@snu.ac.kr

Intriguing properties of several 2D magnetic materials

Recently few years, two-dimensional (2D) van der Waals (vdW) magnetic materials have witness their flourishing era and become a new star in 2D materials beyond graphene[1-4]. There have been a lot of interesting 2D magnetic materials like antiferromagnetic insulator $TMPS_3$ (TM= Ni, Mn, Fe…), CrI_3; ferromagnetic insulator/semiconductor $Cr_2Ge_2Te_6$, ferromagnetic metal Fe_3GeTe_2, to name a few. These layered vdW magnets renders the realization of magnetism in few layer even in atomic monolayer, which promise huge significance both in fundamental physics and possible device applications. Moreover, these material systems give good opportunities to carefully check some well-known theorem like Berezinskii-Kosterlitz-Thouless (BKT) transition and Mermin-Wagner theorem. Here we describe some main discoveries about $TMPS_3$ (TM=Ni, Fe) and VI_3 in our group. With intensive collaboration with other groups, we performed systematic studies on these materials. For example, first we demonstrated the possibility of exfoliation and Raman spectroscopic fingerprint of few-Layer $NiPS_3$ vdW crystals, then we discovered charge-spin correlation in $NiPS_3$ and suppression of magnetic ordering in XXZ-type antiferromagnetic monolayer $NiPS_3$. We revealed Ising-type magnetic ordering in atomically thin $FePS_3$, and then the pressure-induced electronic and structural phase transition of $FePS_3$. Recently we have find out another vdW ferromagnet VI_3, which is the first vdW hard ferromagnet even in the bulk. These interesting discoveries shed light to the promising device application based on them and may sharp the future of spintronics.

References

[1] Park, J. G. J. Phys. Condens. Matter 28, 301001 (2016).
[2] Burch, K. S., Mandrus, D. & Park, J. G, Nature 563, 47-52 (2018).
[3] Gibertini, M. et al., Nat. Nanotechnol. 14, 408-419 (2019).
[4] Gong, C. & Zhang, X, Science 363, eaav4450 (2019).