

Mean Field Theory Investigation of Spin Magnetizations in $\text{MoTe}_2/\text{WSe}_2$ Systems

Palash Saha, Michał Zegrodnik

*AGH University of Science and Technology,
Academic Centre for Materials and
Nanotechnology AGH, A. Mickiewicza Av. 30,
30-059 Krakow, Poland*

psaha@agh.edu.pl
michal.zegrodnik@agh.edu.pl

Abstract

We study the magnetic and topological properties of the $\text{MoTe}_2/\text{WSe}_2$ moiré heterostructure by applying the tight binding model derived in Ref. [1] and supplemented with the onsite Coulomb repulsion terms. Through the use of mean field theory [2], we show the appearance of in-plane and out-of-plane spin magnetizations. The in-plane magnetic ordering realizes the 120 antiferromagnetic pattern. We analyse the evolution of magnetic states with changing carrier concentration and displacement field as well as study the emergence of topological features of the model in proper parameter regime. We discuss our results in the view of the Quantum Anomalous Hall effect reported recently by the experiment [3] as well as the Kondo lattice scenario proposed theoretically last year [4].

References

- [1] Louk Rademaker, Phys. Rev. B, 105,19, 2022, 195428
- [2] Michał Zegrodnik and Jozef Spatek, Phys. Rev. B, 86,1, 2012, 014505
- [3] Li, T., Jiang, S., Shen, B. et al. Yang Zhang, Trithep Devakul and Liang Fu, Nature 600, 2021, 641–646
- [4] Daniele Guerci et al, Science Advances, 9, 11, 2023, eade7701