

Doping-control of excitons and magnetism in few-layer CrSBr

Farsane Tabataba-Vakili

Technische Universität Braunschweig, Braunschweig, Germany. Ludwig-Maximilians-Universität München, München, Germany. Munich Center for Quantum Science and Technology, München, Germany

Abstract

In two-dimensional (2D) magnets, phenomena distinct from bulk magnetism have been revealed, such as sensitivity to charge doping and electric field in few-layer CrI₃ [1]. Within the class of 2D magnets, air-stable CrSBr stands out as an antiferromagnetic semiconductor with a high Néel temperature, excitons coupled to the magnetic order [2], and exciton-magnon coupling [3]. In this talk, I will present our work on doping-control of excitons and magnetism in few-layer CrSBr [4]. We demonstrate that both exciton and magnetic transitions are sensitive to field-effect charging, exhibiting bound exciton-charge complexes and doping-induced metamagnetic transitions. We further visualize magnetic domain formation induced by magnetic field or charge-doping at the metamagnetic transition all-optically by raster-scan reflectance imaging. Our work identifies few-layer CrSBr as a rich platform for exploring collaborative effects of charge, optical excitations, and magnetism.

[1] S. Jiang et al., *Nat. Nanotechnol.* **13**, 549 (2018).

[2] N. Wilson et al., *Nat. Materials* **20**, 1657 (2021).

[3] Y. J. Bae et al., *Nature* **609**, 282 (2022).

[4] **F. Tabataba-Vakili** et al., *Nat. Commun.* **15**, 4735 (2024).