Special Seminar

Friday, September 23, 2022
1 pm

ZNN, Seminar room EG 0.001

also ONLINE via ZOOM

https://tum-conf.zoom.us/j/64580223350?pwd=K2Zkb09GV1R0cTJjWnZJZU15aUlRQT09

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"Towards atomic level engineered interaction of quantum matter in layered materials"

The discovery of quantum materials and the rapid development of instruments equipped to tailor them at the atomic scale are both key enablers for quantum matter engineering with applications in quantum simulation, quantum photonics and spintronics.

In this seminar I will show that the layered magnetic semiconductor CrSBr fulfills several key requirements for controllably engineered quantum matter. First, I will show that CrSBr is electronically a quasi-1D material manifesting in its quasiparticles and their mutual interactions. [1] Second, I will show that CrSBr hosts optically active defects that are correlated with the magnetic phase diagram and with a defect-induced magnetic order. [2] Third, I will demonstrate that CrSBr is highly amenable to atomic manipulation in a scanning transmission electron microscope undergoing an electron beam induced phase transformation. [3] Lastly, I will show deep learning augmented defect detection in CrSBr [4] and give a brief outlook on the prospects for periodic atomic level engineered quantum matter in this material.

Overall, CrSBr offers optically active localized defects correlated with the magnetic phase diagram while being amenable to atomic level manipulation providing new means to access microscopic many-body phenomena using optical spectroscopy.

[1] Klein, J. et al., The bulk van der Waals layered magnet CrSBr is a quasi-1D quantum material arXiv:2205.13456 under review (2022)

[2] Klein, J. et al., Sensing the local magnetic environment through optically active defects in a layered magnetic semiconductor arXiv:2207.02884 under review (2022)

[3] Klein, J. et al., Control of structure and spin texture in the van der Waals layered magnet CrSBr arXiv:2107.00037 in print Nat. Comms. (2022)

[4] Weile, M. and Klein, J. et al., Deep learning facilitated analysis of defects and alloying in a two-dimensional magnet in preparation (2022)

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