Seminar/Talk

Spintronics in two-dimensional van der Waals heterostructures

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Host: Onur Hosten

Abstract: van der Waals heterostructure devices, composed from the assembly of 2D crystals, could enable new spintronics functionalities that are not accessible in individual crystals or any other bulk materials [1]. In this talk, I will present our spin dependent electronic transport measurements in such ultra-thin devices. Firstly, I will demonstrate that by bringing semi-metallic graphene into a proximity to transition metal dichalcogenides, we enhance its weak spin orbit coupling strength three orders of magnitude [2] and simultaneously realize optospintronics functionality [3]. Then, I will show that semiconducting black phosphorus-based van der Waals heterostructures exhibit remarkable spin transport properties [4]after an in-situ h-BN encapsulation process [5]. Finally, I will provide an outlook about 2D van der Waals spin devices after briefly reviewing recently discovered 2D magnets [6].[1] Novoselov, K. S., Mishchenko, A., Carvalho, A. & Neto, A. H. C. 2D materials and van der Waals heterostructures. Science 353, aac9439 (2016).[2] Avsar, A. et al. Spinorbit proximity effect in graphene. Nature Communications 5, 4875 (2014).[3] Avsar, A. et al. Optospintronics in Graphene via Proximity Coupling. ACS Nano 11, 1167811686 (2017).[4] Avsar, A. et al. Gate-tunable black phosphorus spin valve with nanosecond spin lifetimes. Nature Physics 13, 888893 (2017).[5] Avsar, A. et al. van der Waals Bonded Co/h-BN Contacts to Ultrathin Black Phosphorus Devices. Nano Lett. 17, 53615367 (2017).6. Burch, K. S., Mandrus, D. & Park, J.-G. Magnetism in two-dimensional van der Waals materials. Nature 563, 47 (2018).

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Mondi Seminar Room 2, Central Building

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