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Excitons in 2D semiconductors and antiferromagnets

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Abstract

The first part of the talk will be focused on the use of intense THz pulses to transiently modify light-emission of exciton-electron ensembles in monolayer semiconductors and heterostructures. We demonstrate a near complete, THz-induced trion-to-exciton conversion by monitoring time resolved photoluminescence after optical excitation. It is complemented by the ability to transfer populations from higher-order charged biexcitonic complexes and interlayer excitons in heterostructures. This offers new pathways to manipulate exciton-electron mixtures, triggering a non-linear optical response by low-energy photons on picosecond timescales. In the second part, I will discuss exciton transport in the layered semiconducting antiferromagnet CrSBr. Strong influence of the magnetic order on the exciton propagation will be discussed including rapid, non-linear exciton expansion in ultra-thin layers as well as contraction of the exciton clouds at low temperatures. These results are particularly interesting in the context of magnetic control of exciton transport and the consequences of coupling optical excitations to the magnetic order.