

Mobile excitons in two-dimensional semiconductors

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Transport of optical excitations in semiconducting solids plays a central role from both fundamental and technological perspectives. In systems with strong Coulomb interaction the propagation of optically injected carriers is dominated by excitons instead of free electrons or holes. These correlations can affect both the overall energy landscape and the interactions with vibrational modes, with a strong impact on the mobility of the excitations. In two-dimensional semiconductors, the electron-hole correlations present a particularly interesting case combining the properties of Wannier-Mott excitations in inorganic quantum well systems with high exciton binding energies, strong-light matter interaction, and spin-valley degrees of freedom. In addition, the possibility to artificially create heterostructures featuring a manifold of excitonic states as well as the recent demonstration of excitons in two-dimensional magnets offer a rich playground for research and, possibly, technological applications. In this talk, I will discuss optical access to exciton transport via transient microscopy, linear and non-linear diffusion, and present indications of quantum transport phenomena. A particular focus will be placed on interlayer excitons in large-scale reconstructed heterobilayers and the coupling of exciton propagation to magnetic order and fluctuations in layered anti-ferromagnets.