

Beyond the 2D Limit

Band Engineered Control of Exciton Condensates in Coupled van der Waals Systems

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Project Summary: Interlayer exciton properties in two-dimensional transition metal dichalcogenides (TMD) are of great interest due to their large binding energies and long lifetimes. These properties provide an opportunity in ultra-low power bosonic functionality for dissipationless computing, unprecedented long lifetime BECs at high temperatures, and passive electromagnetic sensors. However, realization of such novel optoexcitonic functionality requires a fundamental understanding of the charge population balance resulting from the formation of the interlayer exciton. This work will investigate the charge transfer dynamics and quasiparticle population control of the interlayer exciton in TMD heterostructures via time-resolved photoluminescence and transient absorption spectroscopy. A deeper understanding of these properties will unlock new paradigms in integrated photonic components, front end sensory input, and edge computing.
