

Excitons in Highly-Tunable Ferroelectric WSe₂

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Transition metal dichalcogenides with rhombohedral (3R) stacking order are excellent platforms to realize multiferroelectricity. Here we investigate both intralayer and interlayer excitons in artificially R-stacked bilayer WSe₂, which forms ferroelectric domains due to relaxation and stress. Via optical spectroscopy as a function of doping and external electric fields at cryogenic temperature, we explore the profound effect of the ferroelectric domains, with built-in polarization, and the highly-tunable band structures on the exciton and exciton-polaron (trion) behaviour. We will also describe how the ferroelectric domains can spatially confine interlayer excitons, creating quantum-dot like emitters. This work highlights the interplay between band structure tuning and ferroelectric domain behavior and lays a foundation for future applications in 2D device engineering.