

Proximity Effects in the Excitonic Physics of TaSe₂/MoSe₂ van der Waals Heterostructure

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Abstract

We study the proximity effects in a van der Waals heterostructure composed of semiconducting 2H-MoSe₂ and semi-metallic 2H-TaSe₂. Photoluminescence (PL) measurements at 7 K reveal a redshifted neutral exciton peak and sharp, low-energy emission features, indicating proximity-induced electronic modifications. These spectral signatures are sensitive to factors such as twist angle, interlayer strain, and TaSe₂ thickness. First-principles band structure calculations support these findings, showing a reconfiguration of valence band maxima that promotes indirect transitions. Our results highlight the role of orbital hybridization and interfacial effects in tuning the optical properties of MoSe₂ via TaSe₂ coupling.