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Tightly bound excitons in monolayer transition metal dichalcogenides

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Atomically thin transition metal dichalcogenides (TMDs) MX_2 (M = Mo, W, X = S, Se, Te) have emerged as a new class of two-dimensional (2D) semiconductors. Monolayer TMDs possess a honeycomb lattice structure with broken inversion symmetry that permits interesting valley dependent optical selection rules and Berry curvature effects. Yet, another very distinctive feature of electrons in 2D semiconductors is the significantly reduced dielectric screening of Coulomb interactions. An important consequence of strong Coulomb interactions is the formation of tightly bound excitons. They significantly modify the optical response of the material and play a defining role in the optoelectronic processes. In this talk, I will discuss our recent experiments on the binding energy of excitons and trions and their spin/valley properties in TMDs.