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Features of Charge Density Wave Energy Gap and Electronic Dispersion of $2H-TaS_2$ and Other Layered Transition Metal Dichalcogenides.[1] KAPILA WIJAYARATNE, J. ZHAO, Univ of Virginia, J VAN WEZEL, Univ of Bristol , C. MALLIAKAS, Northwestern Univ, U. CHATTERJEE, Univ of Virginia — We present Angle Resolved Photoemission Spectroscopy (ARPES) study of $2H-TaS_2$, a canonical incommensurate Charge Density Wave (CDW) material, and compare to similar layered transition metal dichalcogenides such as $2H-NbSe_2$. Similarities were observed in the preferential appearance of CDW energy gap in the vicinity of some specific high symmetry points on the Fermi surface, the particle-hole asymmetry of this gap and the existence of the pseudogap behavior above CDW transition temperature. However, in contrast to $2H-NbSe_2$, where the gap opens up only in specific momentum locations in the vicinity of high symmetry points, we observed a non-zero gap for all momentum locations for the case of $2H-TaS_2$. Since the conventional Fermi surface nesting model was unable to explain these similarities and differences, we use a tight binding model with emphasis on orbital selectivity and strong electron-phonon coupling. Further analysis of the electronic dispersion showed pronounced many body renormalization in the system and revealed the phononic mechanism behind momentum and temperature dependent features of the band structure. We suggest that this model can be generalized for a broader class of incommensurate charge density wave materials.

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