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Superconductivity and charge density waves in atomically thin $NbSe_2$

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Atomically thin van der Waals materials have emerged as a frontier for both fundamental physics and device applications. Although novel single-particle and excitonic properties have been extensively studied, the collective electron phenomena in these materials remain less well understood. In this talk, we will discuss superconductivity and charge-density-wave (CDW) order in atomically thin group-V transition metal dichalcogenide $NbSe_2$ down to the monolayer limit. Electrical transport measurements show that the superconducting transition temperature decreases monotonically with reducing the layer thickness. The temperature dependent Raman scattering, on the other hand, shows enhanced CDW order as the sample thickness reduces. While the former can be understood mainly as the result of reduced interlayer Cooper pairing, the latter arises from the enhanced electron-phonon coupling in atomically thin samples. Magnetotransport measurements further reveal the effect of spin-momentum locking, a consequence of broken inversion symmetry and strong spin-orbit coupling in monolayer $NbSe_2$, on Cooper pairing and the in-plane upper critical fields. These results set the stage for the exploration and control of collective electronic phases in 2D $NbSe_2$ and related systems.