Interface-Induced and Tunable Electron-Phonon Scattering in Hexagonal Boron Nitride

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Over the last decade, the layered compound hexagonal boron nitride (hBN) has received significant attention due to its compatibility with most low-dimensional van der Waals (vdW) materials [1]. It resembles graphene both in lateral size, crystalline structure, and Debye frequency, but due to its dissimilar sub-lattices, it hosts a wide energy band gap separating the valence and conduction bands [2]. Recently, hBN was predicted to host strong electron-phonon coupling (EPC) in its electronic π- and σ-bands [3], reminiscent of the interactions that have been reported (and debated) from the σ-bands of graphene [4]. More recently [5], we verified this EPC from energy renormalizations – or "kinks", in the hBN bandstructure.

We will discuss the observable EPC in mono- and multilayer hBN, showcasing how the coupling changes with the substrate interaction, the number of stacked hBN layers, and the intercalation of adatoms (see Figure 1). We will also discuss the generality of EPC at large binding energies and its potential presence in other materials with finite electronic band gaps.

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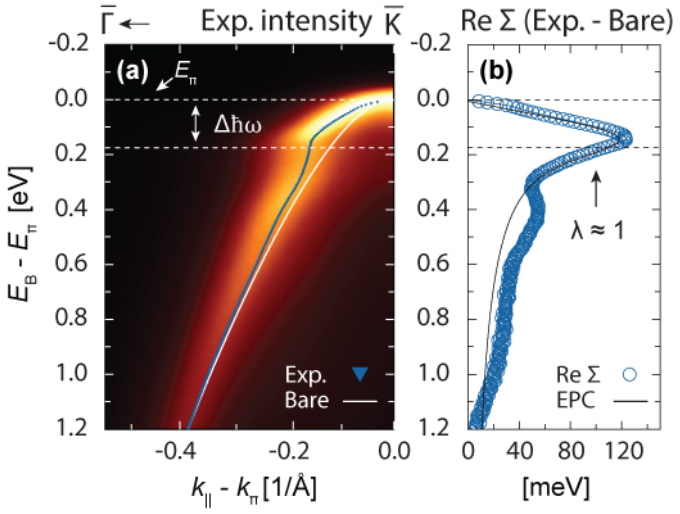

Figure 1: EPC in hBN. **a**: Renormalized π-band of monolayer hBN near the high-symmetry $\overline{K}$ point. **b**: Experimental self-energy (Re Σ) of the renormalized π-band in a. A large electron mass-enhancement (λ≈1) can be observed at an energy Δħω below the band maximum.

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