Effects of inter-layer hybridization on the electronic band structure in hBN/WSe_2 studied by photoemission microscopy

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The isolation of graphene as atomically thin monolayer[1] by means of mechanical exfoliation has paved the way for research on two-dimensional materials: in this field, monolayers of Transition Metal Dichalcogenides (ML-TMDCs) present dramatically more pronounced light-matter interaction than their bulk forms[2]. Recently, new heterostructures known as "Moiré lattices" have sparked particular interest in this area[3–6]: when two materials with a lattice mismatch or a twist are combined and interact by Van der Waals interaction, a superlattice of the crystalline field emerges. The effect of this hybridization on the electronic band structure in Moiré lattices is neither well characterized nor understood.

In this presentation, we report our analysis of a hBN/ML-WSe_2 structure (Fig.1.a)) using "k-resolved Photoemission Electron Microscopy" (kPEEM). We characterize this hybridization, by direct imaging of the system's valence band (Fig. 1 b) and c)), from which we extract key quantities such as spin-orbit-splitting and effective mass. We compare the heterostructure and the individual pristine counterparts independently.

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References

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Figures

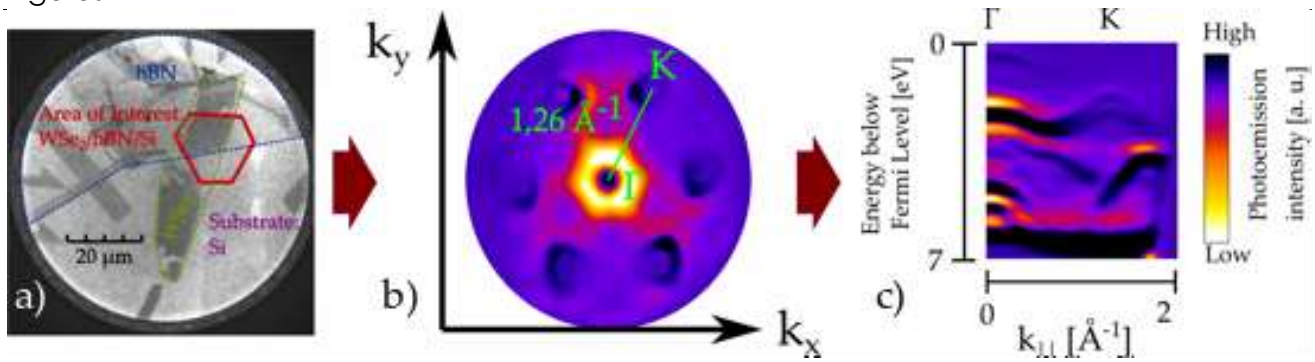

Figure 1: a) Secondary electron image in our system WSe_2/hBN/Si, **b)** Extracted kPEEM image in the (k_x, k_y)-plane at 1.9 eV below Fermi level. Emerging electronic bands around Γ and K-Point are visible. **c)** Extracted electronic band structure (E, k_x) along the Γ-K direction