Moiré Heterostructures, the realm of Quantum Materials

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The notion of Quantum Materials encompasses materials showing emerging quantum phenomena or topological properties. The research on correlated electron systems, topological materials and 2D crystals, once independent of each other, is now converging in the study of Moiré Heterostructures, combining layers with a stacking slightly away from commensurability. A plethora of complex electronic states like superconductivity, magnetism or correlated insulating states has been recently discovered in different Moiré heterostructures. Prominent examples are twisted bilayer graphene or trilayer graphene aligned on hBN. In the talk I will discuss the role of the electronic correlations in these systems and how to connect their effect with the properties of other quantum materials such as high-temperature superconductors.

Figures

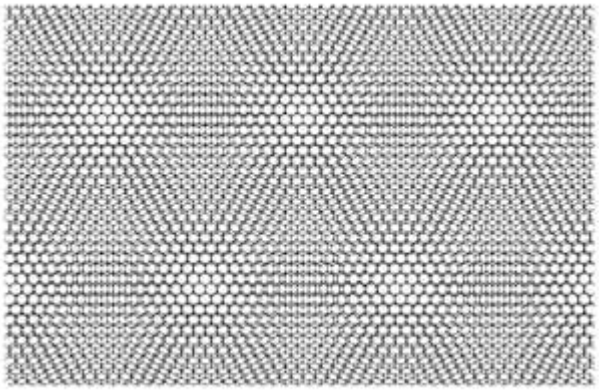

Figure 1: Sketch of a Moiré Heterostructure due to the lattice mismatch between two 2D crystals

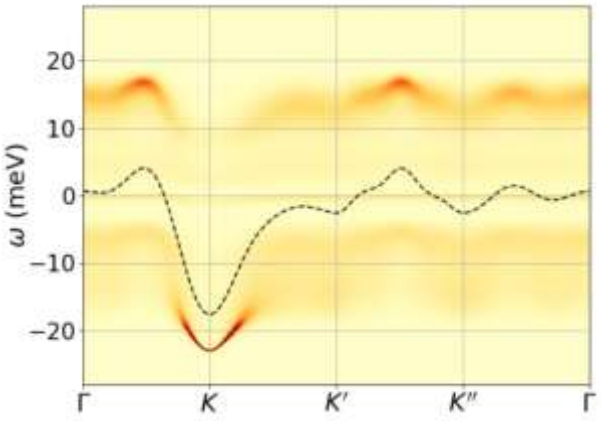

Figure 2: Effect of electronic interactions in the band structure of the moiré heterostructure formed when an rhombohedral trilayer graphene is aligned with the substrate Boron Nitride.