

Prospects in precision organic monolayer device elements at vdW interfaces

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Synthetic molecular self-assembly stands as a versatile equivalent to programmable biomolecular nanotechnology, enabling the fabrication of complex architectures¹. So far, the self-assembly of synthetic architectures has not enjoyed the predictability of its biomolecular counterpart², yet possesses untapped potential for the fabrication of precision organic devices³ - where the active synthetic elements are precisely ordered down to the atomic level. Atomically flat van der Waals (vdW) interfaces offer a simplified paradigm towards prospective precision molecular devices, by seamlessly templating extended molecular monolayers and/or serving as inert electrode interfaces. In this talk, I will present first attempts to computationally-design metal-organic frameworks⁴ and monolayer charge transport systems on boron nitride. I will continue with proof-of-principle optoelectronic response measurements of supramolecular architectures on graphene on diamond interfaces⁵, prospects for their bottom-up three-dimensional growth, and new paradigms for the on-surface coupling of polyaromatic systems on boron nitride⁶ and diamond.

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