

Probing quantum physics in vdW heterojunction nanohybrids

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Van der Waals (vdW) heterojunction nanohybrids consisting of Low-dimensional nanostructures (quantum dots, nanotubes and nanowires, 2D atomic sheets, etc) have recently emerged as a promising platform to design quantum devices and systems for electronics, optoelectronics, sensors, etc. These nanohybrids take advantages of the quantum confinement in constituent nanostructures that enables spectral tunability, superior charge mobility, exotic electronic structures, and other physical properties not typically available in bulks or thin films. This presentation highlights two kinds of examples of such nanohybrids including (1) quantum dots/graphene nanohybrids for ultrabroadband photodetection ranging from ultraviolet, to visible and infrared; and (2) plasmonic MoS₂ and WS₂ nano-disc/graphene biosensors for high sensitivity surface enhanced Raman spectroscopy. The focus of the talk will be on understanding the quantum physics governing the performance of the nanohybrids.