2D materials for quantum applications

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Two-dimensional materials have attracted much attention due to various opportunities for applications. In example, optical properties of transition metal dichalcogenides monolayers can be controlled by several approaches, including via induced interface interaction with magnetic materials [1]. Moreover, the approach of constructing of layered monolayers one on another opened the new routes for advanced devices.

Enhanced infrared photodetection in graphene-based heterostructures due to tunneling barriers has been recently demonstrated [2]. Small-angle twisted bilayer graphene (tBLG) has also attracted much attention due to appearance of low-energy flat bands of the emerging moiré superlattice [3]. Strong electron-electron interactions within the bands lead to correlation-driven phenomena, realization of correlated phases, and result in new devices. We have performed the photoresponse measurements at 5 – 10 μm in the tBLG, where the mis-orientation angle is close to the magic one. We detect the enhanced photoresponse compared to the previous works and reveal the polarization dependence.

Finally, twisted heterostructures are important for creation of quantum simulator to study the Hubbard model physics.

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