CP-02-03

Recent progress on graphene quantum dot devices

Takuya Iwasaki

National Institute for Materials Science

Abstract

Graphene is a promising host material to implement the solid-state spin qubits due to its extremely small spin-orbit and hyperfine interactions. Moreover, the valley degree of freedom in graphene offers the possibility to encode quantum information with novel principles. Although graphene does not have a band gap, graphene quantum dot devices can be realized with confinement potential defined by patterning graphene into a nanostructure or by applying a perpendicular electric field to bilayer graphene. Thanks to the development of transfer technology for two-dimensional materials, gate-defined bilayer graphene quantum dot devices have been recently established for investigating the spin and valley quantum states. Furthermore, van der Waals heterostructures also have the potential to modulate various physical properties of graphene through the proximity effect and moiré superlattice. In this talk, we will present the method to realize high-quality graphene devices, and single-electron transport properties in double quantum dot devices based on the bilayer graphene/hexagonal boron nitride moiré superlattice.