Epitaxial molding of van der Waals quantum lattice

Moon-Ho Jo
Center for Van der Waals Quantum Solids, Institute for Basic Science (IBS) & Department of Materials Science and Engineering, Pohang University of Science and Technology (POSTECH), Pohang 37673, Korea
mhjo@postech.ac.kr

In atomically thin van der Waals (*vdW*) solids, electronic and atomic motions are tightly confined within two-dimensional (2D) lattices, giving rise to diverse electronic and optical excitations. Such emergent properties are yet to be further explored, when the 2D *vdW* lattices are artificially molded into novel crystals. In this talk, we present our recent developments of epitaxial molding of *vdW* heterostructures, achieved by deterministic *vdW* epitaxy in atomic precisions. The first example is the imbedded Luttinger liquid on monolayer MoS_2 bicrystals by epitaxial tuning of mosaic textures, in which we showcase the epitaxial 1D metal arrays to build integrated low-power logics circuitry [1-3]. We also discuss another demonstration of modular *vdW* heterostructures, into which diverse 2D electronic phases can be achieved and assembled by layer-by-layer ion exchanges in epitaxial manners [4]. Epitaxial realization of new *vdW* lattices and their heterostructures in this study suggest novel synthetic pathways for construction of diverse 2D quantum solids.

References

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