[QMS2020 invited talk]

Novel optoelectronic functionalities in low dimensional transition metal dichalcogenide nanomaterials

Yijin Zhang[1]

[1]*Institute of Industrial Science, The University of Tokyo, Tokyo, Japan*
email: yzhang@iis.u-tokyo.ac.jp

Group VI-B transition metal dichalcogenides (MX_2, M = Mo, W, X = S, Se, Te, abbreviation: TMDs) are representative two-dimensional materials. TMDs are semiconductor with relatively small band gap in their most stable triangular prismatic (2H) phase, which opens the opportunity to apply TMDs to practical electronics and optics. Furthermore, their layered structure in nature facilitates modulation of crystal symmetry by reducing the number of layers or rolling up the two-dimensional sheets. Reduced crystal symmetry induces the valley degree of freedom associated with Berry phase, Berry curvature, and Berry connection. These features play their own roles in optoelectronic phenomena [1].

We had demonstrated that changing dimensionality and reducing the crystal symmetry affect the material properties dramatically and leads to emergence of new functionality. In my talk I will introduce the optoelectronic properties and potential optoelectronic applications of inversion asymmetric two-dimensional TMDs and their nanotube form. These works were done in collaboration with groups of Dr. Jurgen Smet (Max Planck Institute for Solid State Research, Germany), Prof. Yoshihiro Iwasa (University of Tokyo, Japan),

[1] Xiao *et al.*, Phys. Rev. Lett. **108**, 196802 (2012).
[2] C. Author, D. Author, and E. Author, Phys. Rev. Lett. **100**, 123456 (2018).