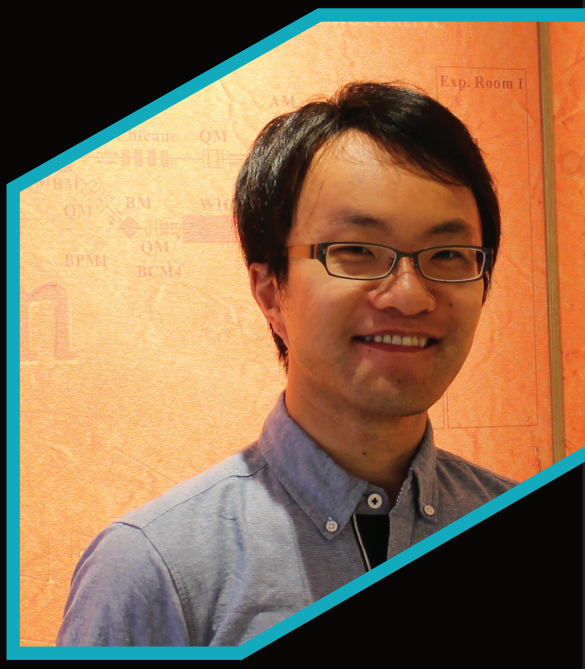
FLEET

ARC CENTRE OF EXCELLENCE IN FUTURE LOW-ENERGY ELECTRONICS TECHNOLOGIES

FLEET SEMINAR

Optoelectronic functionalities in transition-metal dichalcogenides



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Abstract: Group VI-B transition-metal dichalcogenides (MX2, M = Mo, W, X = S, Se, Te, abbreviation: TMDs) in the triangular prismatic phase are new class of semiconductors. Due to their favourable and rich electronic and optical properties, TMDs have attracted considerable interest. The peculiar properties of TMDs includes the emergence of the valley degree of freedom and the associated valley-contrasting optical selection rule, spin-orbit interaction, and topological Berry curvature. These features provides a fruitful playground for fundamental science as well as a high potential for various practical application ranging from the conventional electronics and optics to the next generation information technologies such as spintronics and valleytronics. Many of the unique features appear by breaking the inversion symmetry of the quasi-two-dimensional bulk single crystal. This can be realized by isolating a two-dimensional monolayer sheet out of the bulk or applying external field. The dimensionalities can further be reduced to quasi-one-dimensional by rolling up the two-dimensional sheets to form a tubular structure, whose number of symmetry operations is apparently even less than that in monolayer.

We have been investigating the electronic and optical properties of TMDs in different crystal structures. In my talk, I will start from a brief introduction to TMDs and then present several experimental results. My talk will in particular focus on optoelectronic functionalities.

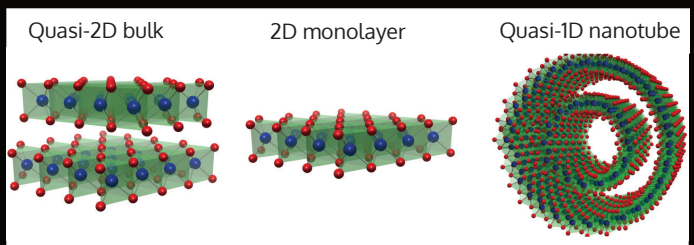

Figure: Schematic crystal structure of TMDs with different crystal symmetries. Blue and red spheres represent transition-metal and chalcogen atoms, respectively. Green surface represents the triangular prismatic arrangement of six chacogen atoms.

DATE: Friday 2 November
TIME: 10:00 - 11: 00 AM
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