Band Engineering of 2D TMDs for Spin and Valleytronics

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Engineering two dimensional (2D) layered materials having high spin-orbit coupling (SOC) in their monolayer limit is intriguing due to the possibilities of tweaking different symmetries. For example, monolayer MoS_2 is a high SOC system having broken inversion symmetry. This brings the possibilities of bringing valley selective excitations to this monolayer system and hence towards valleytronics. Addition of time-reversal symmetry breaking, hence magnetism, to this system introduces bandgap differences in the valleys, making its practical feasibility in valleytronics. Our recent studies indicate that room temperature valley splitting can be brought in MoS_2 and the selection of metal dopant is highly imperative for such splitting. We found that dopant such as V, Cr etc. can bring interesting electronic and valleytronics properties to MoS_2. The talk will be discussing some of these 2D materials along with their future scope in spintronics and valleytronics applications.

References:

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