There is plenty of room at the van der Waals 2D heterostructures

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Recent development of two-dimensional layered materials such as graphene, hexagonal BN, and transition metal dichalcogenides have drawn much attention due to their fascinating uniquely defined physical and chemical properties. What is more intriguing is their heterostructures in particular vertical stacking. The van der Waals layers without dangling bonds allow us to stack them together by transfer without having difficulties of lattice mismatch during sample preparation. Ultrathin atomic layer control is another advantage to introduce unique tunnelling phenomenon and also changes the concept of optoelectronic devices and electronics devices due to short channel length, which cannot be often described by classical approach but necessarily introducing quantum mechanical concept. In this talk, we will introduce several examples of such heteorstructures that could reveal a new function of devices and extraordinary devices performances in optical communications, electronics and optoelectronic devices.

References

[1] H. S. Lee et al., Phys. Rev. B 93 (Rapid Comm), 2016, 140409; Phys. Rev. Lett. 115, 2015, 226801; Nature Comm. 7, 2016, 13663.
[2] Vu et al., Nature Comm. 7, 2016, 12725; NanoLett. DOI: 10.1021/acs.nanolett.6b04449
[3] W. J. Yu et al., Nature Comm. 7, 2016, 13728.

Figures

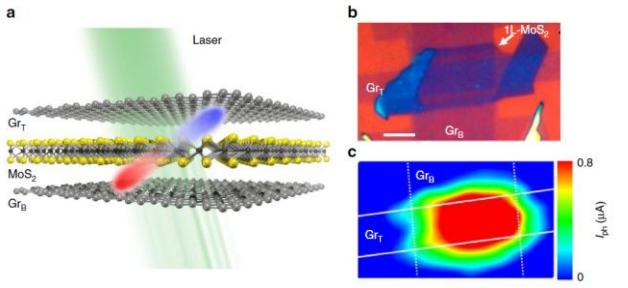

Figure 1: Photocurrent mapping from Gr/MoS_2/Gr.

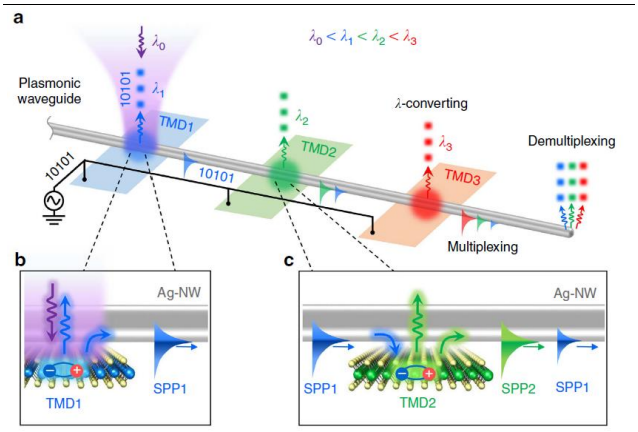

Figure 2: Wavelength multiplexing from Ag nanowire/TMDs.

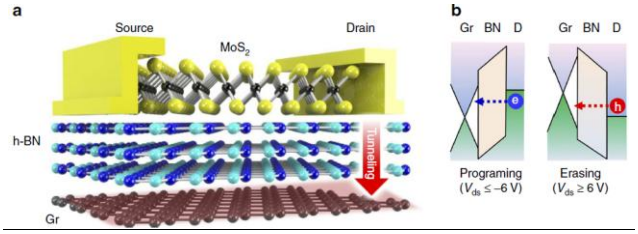

Figure 3: Two-terminal tunneling memory with MoS_2/BN/Gr.