# Spectroelectrochemistry and spectroelectrophotonics on an exfoliated van der Waals graphene/TMD bilayer

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Direct bandgap, monolayer transition metal dichalgonides (TMDs) recently attracted a lot of attention due their unique light-matter interactions. Van der Waals heterostructures (vdWh) consisting of combinations of different TMDs are considered a promising candidate for novel optoelectronic devices [1]. Up to now, most attention has been paid to electron and energy transfer in vdWh consisting of different TMDs. However, not much is known about energy and charge transfer between monolayer TMDs and graphene (GN) [2], and the possibilities of using the energy or charge transferred to GN to change the Fermi level of GN optically.

Using photoluminescence (PL), Raman scattering spectroscopy and μ-droplet spectroelectrochemistry (SECH) [3], we studied the interactions in a vdWh consisting of exfoliated monolayer GN and exfoliated monolayer MoS2 or WS2. Using a careful analysis of the changes in the intensity and Raman shift of the Raman modes of both the TMD and the GN, and the PL as a function of either the photon flux or the applied gate voltage, the interactions between both layers are studied. Furthermore, we addressed the efficiency of the spectroelectrophotonics with respect to the SECH.

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## References

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