Raman Analysis on WSe_2 Encapsulated Graphene Devices

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Large-scale high mobility graphene devices are an interesting platform for a broad range of applications. Current high mobility graphene devices are based on hexagonal Boron Nitride (hBN)-encapsulated graphene[1]. However, large-scale growth of multi-layered hBN flakes has remain elusive. Transition Metal Dichalcogenides (TMDs) have emerged as a valid encapsulation material for graphene[2]. Recently, in contrast to hBN, many groups have demonstrated large-area single-domain growth of TMDs[3]. In this work, we present the Raman characterization of TMD-encapsulated graphene heterostructures and compare them to hBN-encapsulated graphene devices. In particular, we compared the FWHM of the 2D-peak and the scattering plots. Notably, WSe_2 top encapsulated CVD-grown graphene show 2D-peak FWHM values as low as 20 cm^{-1}, even on the SiO_2 substrates. Direct comparison of the Raman data suggests WSe_2 as a suitable encapsulation material for graphene.

References

[1] Banszerus, Luca, et al, *Nano letters* 16.2 (2016): 1387-1391.
[2] Banszerus, Luca, et al, *2D Materials* 4.2 (2017): 025030.
[3] Chen, Jianyi, et al, *Advanced materials* 30.4 (2018): 1704674.

Figures

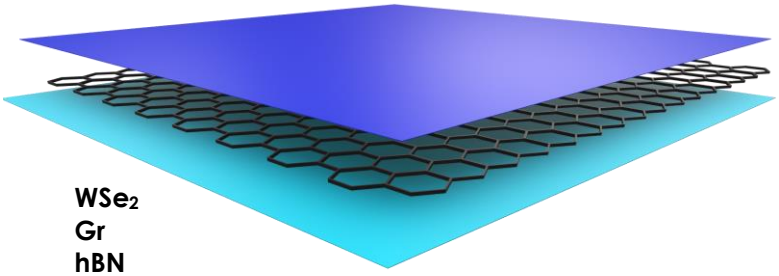

Figure 1: Schematical representation of the TMD encapsulated Graphene heterostructure.

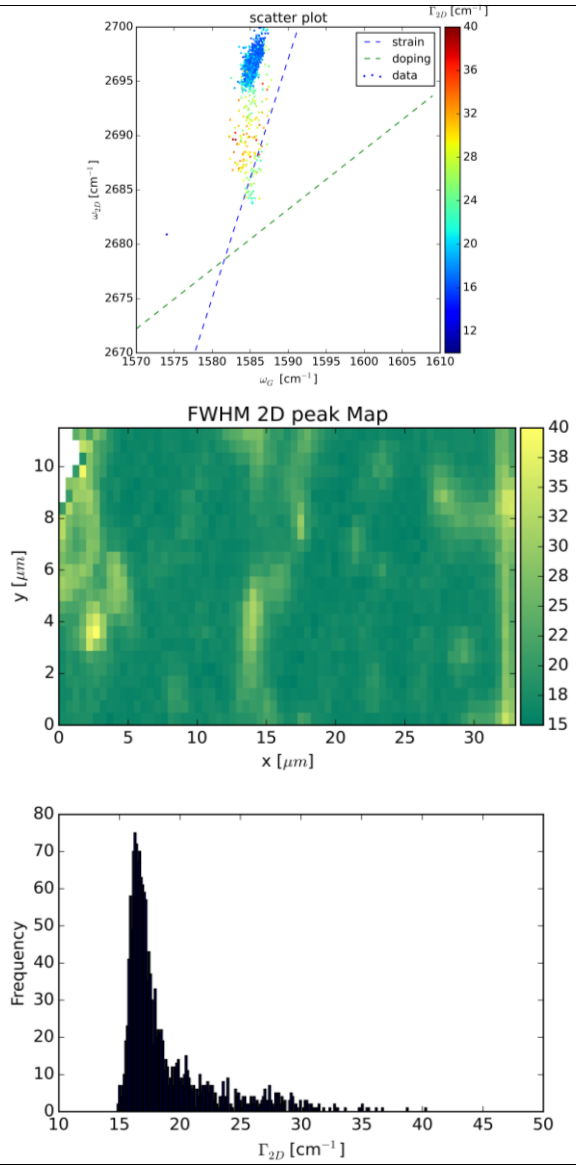

Figure 2: Raman Data of the encapsulated devices. a) Scatter plot, b) Map of 2D FWHM c) Statistical 2D FWHM plot over the sample area.