Mapping heterogeneities and instabilities layer-by-layer in two-dimensional Bio-Nanointerfaces using surface plasmons

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Interfaces based on two-dimensional (2D) materials represent a class of highly-efficient platforms for monitoring of molecular interactions in various transduction modes.[1]. The implementation of these 2D materials as transducers offer unique advantages for the biosenor interface, such as increase of sensitivity, ease of functionalization and a broad range of surface properties. However, detailed understanding of various heterogeneities in 2D material-based interfaces and their influence on the molecular interactions remain ambiguous for analytical understanding and explanation of transduction mechanisms. [2]
In this work, layer-by-layer graphene constructs were realized by a dry transfer technique onto Surface Plasmon Resonance (SPR) active substrates in order to study interfacial inhomogeneity, and layer dependencies in plasmon characteristics created due to synthesis and transfer processes. Thereby, we present a newly developed analytical model, with an increased sensitivity and easier direct functionalization of the receptor molecules, without the use of thick surface hydrocarbon matrices, employed in current commercial sensing platforms. These advantages are given by the enhanced plasmonic activity, electrical tuneability [3] and the presence of strong π-π interactions, all provided by the electronic and chemical properties of graphene.

References

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[2] Zeng, Y. J., Hu, R., Wang, L., Gu, D. Y., He, J. N., Wu, S. Y., Ho, H. P., Li, X. J., Qu, J. L., Gao, B. Z., Shao, Y. H., Nanophotonics, (2017) 1017
[3] de Abajo, F. J. G., Acs Photonics, 3 (2014) 135-152

Figures

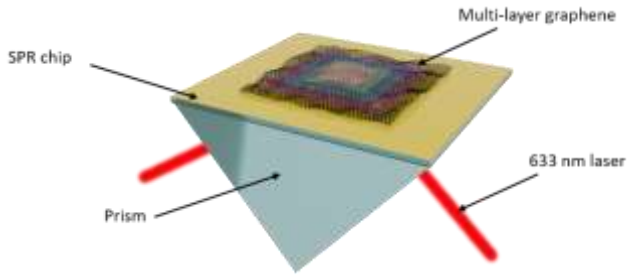

Figure 1: Schematic representation of the SPR biosensing platform.

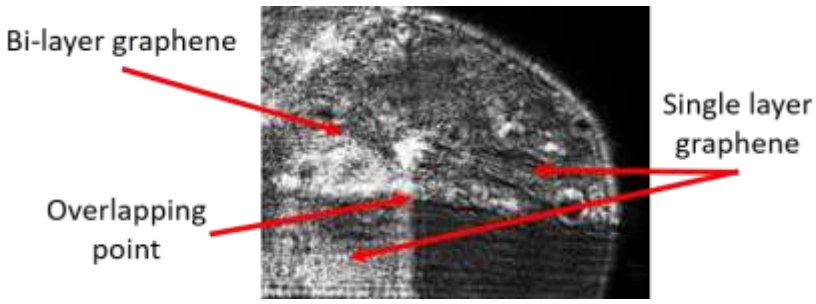

Figure 2: Imaging SPR (iSPR) of a multi- layer graphene transfer.