Covalent functionalized graphene surfaces for nanobiohybrid interfaces

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Graphene functionalization is expected to exhibit potential applicability in many biosystems of broad interest that need to graft bioreceptors, metal NP or other systems to its surface. However, its high chemical inertness makes difficult a controlled and selective functionalization. [1] Many works performed up to the date report different attachment strategies: electrostatic molecular adsorption, π-π stacking or covalent bonding. This last strategy is one of the most used for the robustness of the bond, but also is the one adding more concerns to the preservation of the electrical performance needed for biosensing.

We present here a facile and controllable methodology to decorate a graphene surface with covalently linked organic spacers containing exposed thiol and amine functionalities that can be employed in diverse bio applications with conserved electrical performance. [2],[3]

This methodology opens the door to the growth of controllable and stable nanobiohybrid structures on graphene platforms [4], with a broad applicability in plasmonic, biotechnology, and biomedicine.

References

[1] Bueno *et al*, Nature Communications, 8 (2017) 1
[2] Hébert *et al*, Advanced Functional Materials, 28 (2018) 1703976
[3] Masvidal *et al*, Nature Materials, 18 (2018) 280
[4] Bueno *et al*, ACS Omega, 4 (2019) 3287

Figures

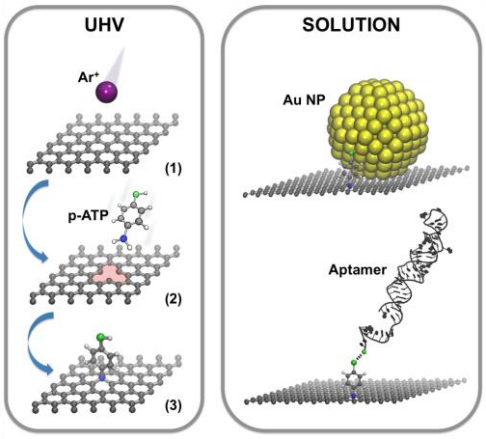

Figure 1: Schematic illustration of the two-step functionalization process with Ultra High Vacuum (UHV) and the conjugation of the thiol-modified ssDNA aptamer and AuNP to the thiol group.

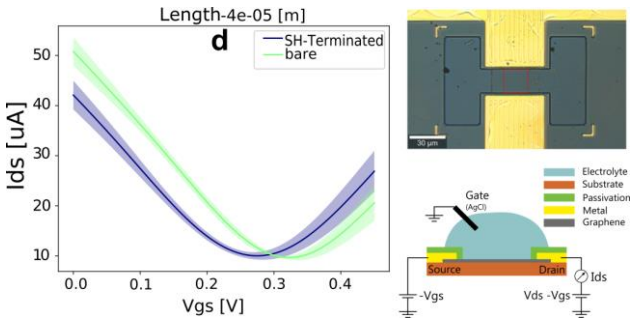

Figure 2: Optical microscopy Image of the solution-gated field-effect transistor (gSGFET) and the cross-section of the gSGFET device. Characterization curves of the CVD transistor before and after functionalization with pATP