TAILORED CHEMICAL DESIGNS FOR GRAPHENE FETS IN BIOSENSING

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Graphene field effect transistors (GFETs) have gained prominence in the field of biosensing due to their high sensitivity and selectivity, low detection limit and ability to function *in vivo*.[1] This is mainly due to the high carrier mobility of graphene and its added properties, such as biocompatibility, transparency, and flexibility. Thus, GFETs are able to detect various biomolecules, including proteins, DNA, and small molecules, with high specificity and sensitivity in a variety of media. The mandatory functionalization of graphene with different receptors or biorecognition elements has been achieved using various chemical approaches, (*i.e.*, covalent binding, non-covalent binding, and electrostatic adsorption). However, the challenge of finding the best immobilization strategy for the receptor remains, as not all graphene chemistry strategies can be easily adapted to transistor modification.
By controlling graphene functionalization and tuning the device design, we have developed diverse GFET microarrays to detect small molecules, such as neurotransmitters and air pollutants; and viral proteins with an extremely low limit of detections.[2-3] These results could establish the basis for a new category of analytical platforms based on well-defined graphene modification. Such platforms would have the potential to detect a wide range of pathogens and biomarkers even before their isolation. This capability could prove useful in health and environmental monitoring, as well as in fighting future pandemics.

References

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[3] A. Silvestri *et al.*, Nanoscale, 3 (2023), 1076–1085.
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Figures

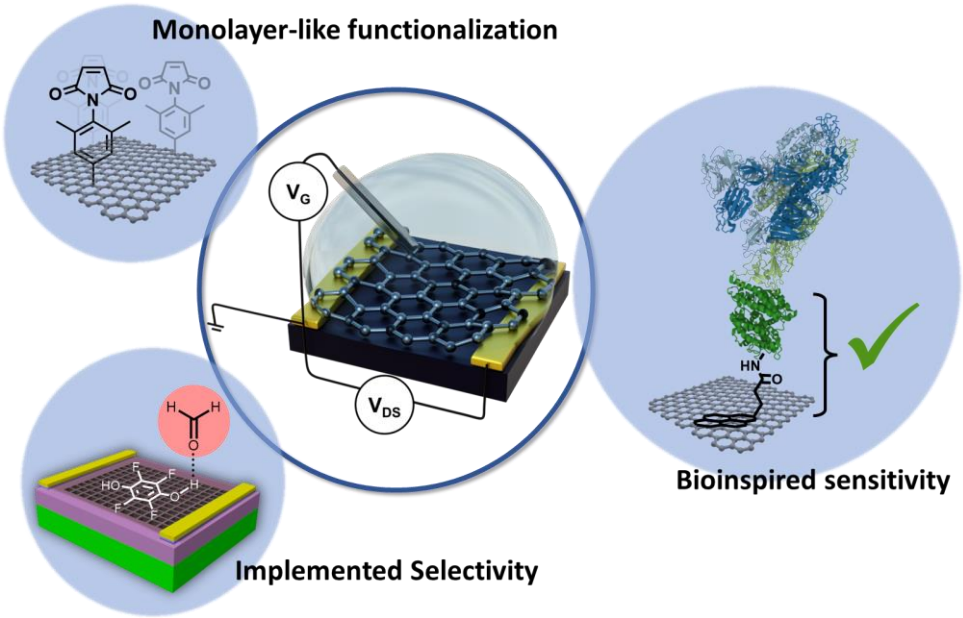

Figure 1: Schematic representation of diverse designs used in GFET sensors.