Graphene-based biosensing using an SSM-based technology

Melanie Meincke
Andre Bazzone, Michael George, Niels Fertig, Izabela Kamińska, Philip Tinnefeld
Nanion Technologies, Ganghoferstraße 70A, 80339 Munich
Ludwig-Maximilians-Universität, Department of Chemistry**,** *Butenandtstraße 5-13, 81377 Munich*
melanie.meincke@aol.com

Abstract

Graphene-based solution-gated field-effect transistors (SGFETs) have emerged as a promising platform for a variety of sensing applications due to their outstanding properties. With a high surface-to-volume ratio and excellent electrical conductivity, graphene offers exceptional sensitivity and selectivity in detecting target molecules in solution. However, the performance of SGFETs is highly dependent on the quality of the graphene, the properties of the solution, and the measurement system used. In cooperation of Nanion Technologies and the LMU Munich, we present a novel graphene based SGFET measurement system that offers several advantages over traditional measurement systems. Our system incorporates a robot-controlled pipette which loads solution from storage vials and injects them to the sensor enclosed by a Faraday cage. This allows for precise control of the solution flow rate and rapid delivery of target analytes to the SGFET sensing area. The system also incorporates a highly sensitive low-noise amplifier for reliable and accurate measurement of the SGFET response. We demonstrate the performance and stability of our system by measuring the response of graphene SGFETs to various biomolecules and chemical analytes. Our results show that our measurement system offers improved selectivity, reproducibility, and signal-to-noise ratio compared to traditional measurement systems. Thus, this novel measurement system could pave the way for the development of more advanced and reliable graphene-based SGFET sensors for various applications, including cell-based biomedical diagnosis and chemical detection.

References

[1] Bazzone, A., Körner, A., Meincke, M., Bhatt, M., Dondapati, S., Barthmes, M., ... & Fertig, N. (2022). SSM-based electrophysiology, a label-free real-time method reveals sugar binding & transport events in SGLT1. Biosensors and Bioelectronics, 197, 113763.

Figures

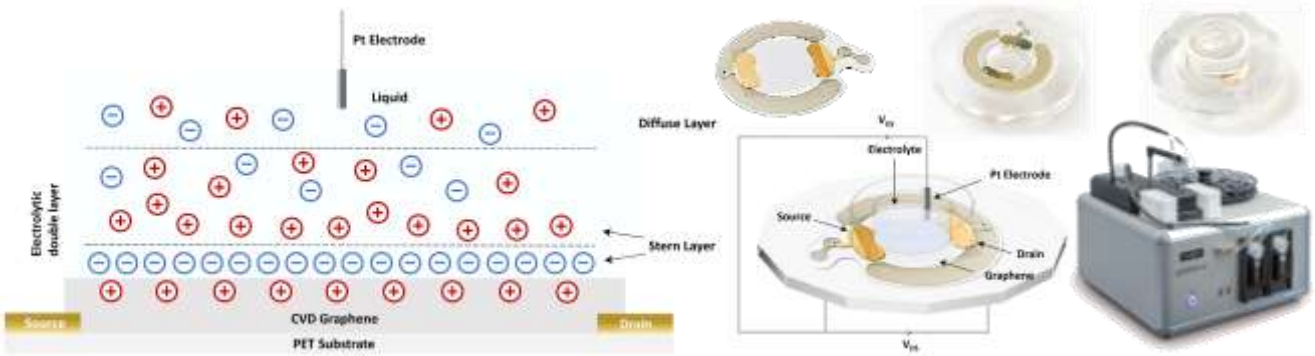

Figure 1: Experimental SGFET setup including the sensors and the SSM technology.