Graphene integration in an SSM technology

Melanie Meincke
A. Bazzone, S. Holzhauser, M. Barthmes, L. Richter, M. George, N. Fertig, I. Kamińska, P. 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) hold immense promise for sensing applications due to their remarkable properties, including high surface-to-volume ratio and superior electrical conductivity. However, their performance hinges on graphene quality, solution characteristics, and integration into existing measurement systems. In collaboration with Nanion Technologies and LMU Munich, we introduce an innovative graphene-based SGFET measurement system based on an existing Solid Supported Membrane (SSM) technology which was developed for membrane transporter analysis. Our system integrates a robot-controlled pipette for precise solution delivery to the sensor enclosed within a Faraday cage, ensuring accurate control of solution flow rates and rapid analyte delivery. Additionally, a highly sensitive low-noise amplifier enhances reliable SGFET response measurement. We validate our system's performance by assessing graphene SGFET responses to various biomolecules and chemical analytes. Moreover, we demonstrate the biosensors' use as a capacitive sensing system for transporter measurements. Our novel measurement platform holds potential for advancing graphene-based SGFET sensors in applications such as 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

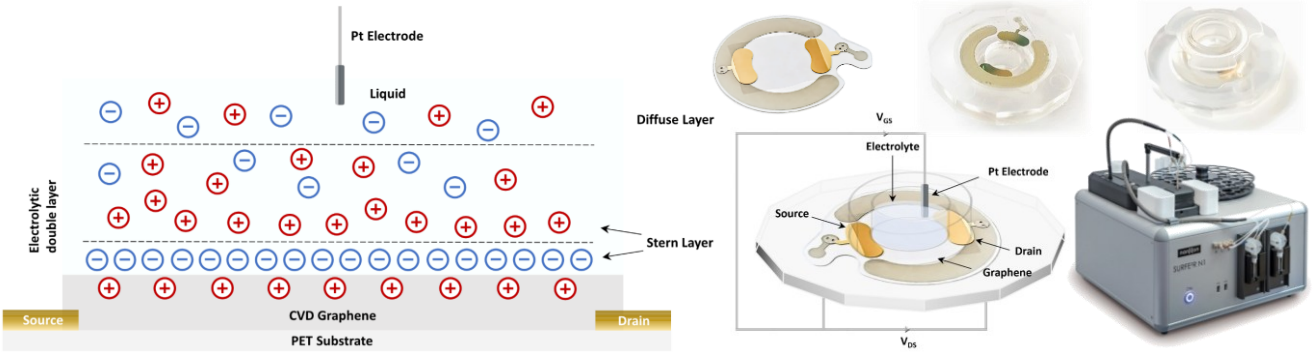

Figure 1: Experimental SGFET setup including the sensors and the SSM technology.