Internship position: Noise characteristics of solid-state nanopores

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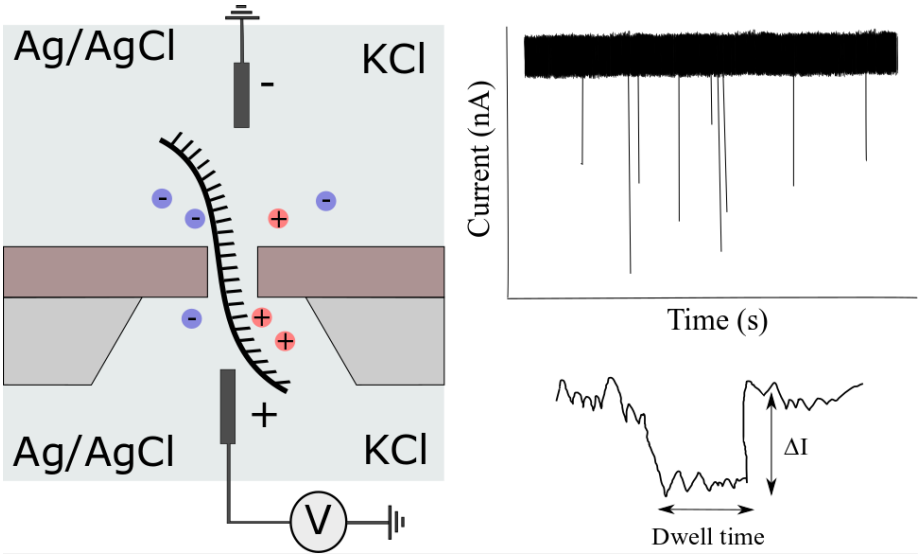
Sequencing biopolymers, such as DNA, RNA, and proteins, is an important step towards precision medicine, where treatment plans are made based on the individual properties of the patients instead of population-wide averages. The current state-of-the-art sequencing devices use biological nanopores, i.e. channel proteins embedded in lipid bilayers. Despite their popularity, several drawbacks related to stability, scalability and limited pore size remain. Thin membranes fabricate with solid-state materials, such as silicon nitride and silicon oxide, can be used to overcome these issues. In addition to drilling with focused electron and ion beams the nanopores can be fabricated by using a method called controlled dielectric breakdown (CBD).



To be able to record the biomolecule translocation events, the measurements have to be done at high bandwidths (> 10 kHz). This increases the capacitive noise originating from the chip. Our group is currently exploring the possibility to reduce this capacitive noise and improve the measurement system using silicone elastomers. We are looking for an intern (2-4 months) to develop and build a system for more precise and automated application of these elastomers. The project also involves analysis of the noise characteristics of the chips and translocation measurements. Depending on the length of the internship, additional tasks, such as studying surface chemical functionalization and its effects on translocation experiments as well as some analytical characterization of the chips using optical and electrical methods can be added.

We are looking for a highly motivated candidate with research-oriented mindset. The desired prerequisites include especially interest in hands-on working and building of experimental setups. Some previous experience with MatLab and/or LabVIEW is an added advantage but not required.

If you're interested in the project, send a short motivation letter together with your CV and study transcript (both in English) to noorai@kth.se. It is possible to get credits through the course EK2210 for their project work.

References:

Tabard-Cossa, V., Trivedi, D., Wiggin, M., Jetha, N. N., & Marziali, A. (2007). Noise analysis and reduction in solid-state nanopores. Nanotechnology, 18(30). https://doi.org/10.1088/0957-4484/18/30/305505

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Kwok, H., Briggs, K., & Tabard-Cossa, V. (2014). Nanopore Fabrication by Controlled Dielectric Breakdown. PLoS ONE, 9(3), e92880. https://doi.org/10.1371/journal.pone.0092880