Chemical Synthesis of Switchable Protein-Based Nanopores

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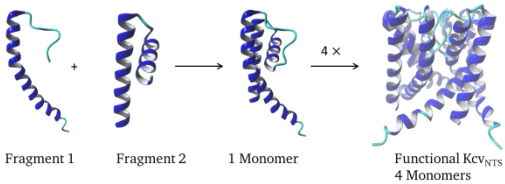
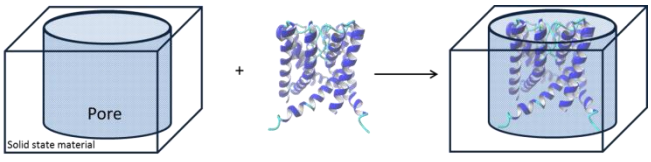
The basic principle of a modified nanopore is to detect chemical or physical properties transducing them through a microelectronic device into electrical signals. Therefore such pores are highly suitable to be incorporated into miniaturized electronic components for biomedical or analytical applications. In living organisms, the transport of ions is performed by ion channels and transporters. Basic principles of the working mechanism and the reason for their efficiency/high selectivity are well understood to date. However, their functionality is only provided in mechanical instable lipid membranes. Synthetic nanopores are mainly based on silica materials or organic polymers and were demonstrated to be useful as sensory devices for analytical applications. Unfortunately, their sensitivity and selectivity is much lower than for biological pores. Thus, the combination of biological and synthetic nanopores as a hybrid pore system should overcome current limitations of conventional pore systems.

For this reason we focused our studies on the development of switchable protein-based nanopores mimicking biological ion channels that can be integrated into solid state material. We here present first results towards the synthesis of the viral potassium channel Kcv_{NTS} [1] using Solid Phase Peptide Synthesis (SPPS) and Native Chemical Ligation (NCL).

Step 1: Synthesis of viral potassium channel



Step 2: Integration of channel into pore within solid state material



References
[1] C. J. Braun, et al., BBA - Biomembranes, **1838**, 1096-1103 (2014)