BP 14: Posters - Biotechnology and Bioengineering

Time: Monday 17:30–19:30 Location: Poster C

BP 14.1 Mon 17:30 Poster C

Hydrodynamic Flow Control from Micro- to Picolitres — •Katja Prasol and Claus Fütterer — Biophysical Tools GmbH/Forschung, 04317 Leipzig, Germany

During the last decade biophysists, biochemists and biologists moved to microfluidics in their applications. Prokaryotic and eukaryotic cells are cultured and investigated in microfluidic chips, they are sorted in microfluidic systems, other molecules, even DNAs, are being observed in micro-droplets.

All of these applications are highly dependent on a precise flow control, which is conventionally done with syringe or peristaltic pumps. However, such approaches have a number of bottlenecks. Smallest irregularities in piston motion of syringe pumps are strongly hydrodynamically amplified in the flow velocity. The peristaltic pump, based on squeezing of tubing, does not allow precise determination of the perfused volume and generates strongly pulsatile flow.

Within our research we focused on the development and testing of novel pressure-driven flow control methods. Recently we developed a new pneumatic flow control principle. Our new system overcomes the bottlenecks of conventional flow control methods including the current state-of-the-art in microfluidic flow control (Fütterer et al., Injection and Flow Control in Microchannels, Lab Chip, 4, 351, 2004). Further, we present data on stability, fast dynamics as well as a number of real and future applications in biology, biophysics and medical research.

BP 14.2 Mon 17:30 Poster C

Exploring the secondary structure of xanthan by atomic force microscopy — •Julia Teckentrup[1], Orooba Al-Hamood[1], Tim Steffen[2], Hanna Bednarz[2], Volker Walhorn[1], Karsten Niehaus[2], and Dario Anselmetti[1] — [1]Experimental Biophysics, Bielefeld University, Germany — [2]Proteome and Metabolome Research, Bielefeld University, Germany

The polysaccharide xanthan which is secreted by the γ-proteobacterium *Xanthomonas campestris* is an industrial scale used food thickening agent and rheologic modifier. Its great commercial importance calls forth to optimize the xanthan production. By targeted genetic modification the metabolism of *Xanthomonas* can be modified in such a way that the xanthan production efficiency or the shear-thickening potency is optimized.
Using atomic force microscopy (AFM) we analyzed the secondary structure of single xanthan polymers produced by wild-type *Xanthomonas campestris* B100 and several genetically modified variations. We found a wide variation of characteristic differences between xanthan molecules produced by different stems ranging from single linear polymers to branched xanthan double strands. These results can help to get a better understanding of the metabolic pathways that are relevant for xanthan synthesis. Furthermore, variations of the xanthan secondary structure can explain its viscosifying properties.

BP 14.3 Mon 17:30 Poster C

Influence of different hydrophobic tags on structural properties and membrane insertion probability of artificial DNA nanopores — •Alexander Ohmann, Kerstin Göpfrich, and Ulrich F. Keyser — Cavendish Laboratory, University of Cambridge, CB3 0HE, UK

Biological ion channels are involved in numerous cellular processes and their dysfunction constitutes key events in many pathological processes. It has been shown that the directed folding of DNA allows the fabrication of versatile and programmable synthetic ion channels that can self-insert into the lipid membrane via hydrophobic tags such as cholesterol. However, number and type of hydrophobic tags employed have a significant influence on the structural properties of individual DNA constructs, their behavior at higher concentrations, and their insertion probability into the lipid bilayer. Here, we present initial results on understanding these effects by a thorough analysis of nanoscale DNA constructs assembled entirely from chemically synthetized DNA single strands modified with a variety of hydrophobic tags. The influence on structural properties have been studied on the single molecule level as well as in bulk. Electrophysiological measurements provide insight into their insertion efficiency as well as their characteristics as ion channels. The results of our study greatly enhance our understanding of how to design such artificial ion channels and optimize their insertion efficiency. Making them more adaptable to ambient conditions such as hydrophobicity and salt concentration these synthetic nanopores therefore become increasingly attractive for biomedical applications.