BP 16: Biotechnology and Bioengineering

Time: Tuesday 11:30–12:30 Location: HÜL 386

Invited Talk BP 16.1 Tue 11:30 HÜL 386

Control on the nanoscale with DNA origami — •Tim Liedl — Ludwig-Maximilians-Universität München

I will discuss two recent applications of DNA origami that illustrate the exceptional control that this technique provides on the nanoscale. Despite enormous efforts, placing guest molecules in designed DNA crystals remains a challenging goal. Ned Seeman and Chengde Mao reported a 3D DNA crystal based on the "tensegrity triangle", where three DNA duplexes are interconnected in a self-restricting over-under, over-under, over-under fashion. By adopting their design principle, we present a tensegrity triangle design based on DNA origami that crystallizes into three-dimensional, micrometer-scale assemblies that can host gold nanoparticles at designated sites. Then I will present a DNA origami-based method of force spectroscopy that uses self-assembled nanoscopic power gauges, requires no macroscopic tools (magnetic tweezer, AFM tip or alike) to connect to the macroscopic world and can analyze large numbers of molecules in parallel. To exert the force, a single-stranded DNA that contains a specific sequence capable of recruiting a molecule of interest, spans from one arm of the DNA origami force clamp to the other. The force applied to the system can then be tuned by changing the length of the single strand in different variants of the force clamp. Note that the ssDNA here acts as an entropic spring element, whose spring constant is dependent on the number of bases per unit length. In our experiments we first studied a well-known Holliday junction sequence as a benchmark and then determined above which forces TBP fails to bind the TATA box.

BP 16.2 Tue 12:00 HÜL 386

Micropatterning of reagent-free, high energy crosslinked gelatin hydrogels for bioapplications — •Astrid Weidt[1], Benedikt Heyart[2], Emilia Wisotzki[1,3], Mareike Zink[1], and S.G. Mayr[3,4] — [1]Nachwuchsgruppe Biotechnologie und Biomedizin, Soft Matter Physics Division, Universität Leipzig, Germany — [2]Institut für Biochemie und Biotechnologie, Technische Universität Braunschweig, Germany — [3]Leibniz Institut für Oberflächenmodifizierung (IOM) e.V., Leipzig, Germany — [4]Division of Surface Physics, Universität Leipzig, Germany

The development of biocompatible materials that support the regeneration of soft tissues is of high importance for medical applications. Materials such as collagen and gelatin show a great potential as graft materials and cell carriers, since they originate from the extracellular matrix. Adequate structuring of hydrogels as cellular substrates is mandatory for successful cell adhesion. Here, a reagent-free method for crosslinking and subsequent micropatterning of gelatin hydrogels was demonstrated. The simple and effective method of micromolding was employed to transfer structures in the micrometer range during electron irradiation onto gelatin. Thermally-stable substrates were fabricated, characterized by regular grooves with widths of 3.75 to 170 *m and depths of several hundred nanometers. We show that the microstructured hydrogels promote cell adhesion and contact guidance of NIH 3T3 mouse embryonic fibroblasts. Cells attached and adapted on the surfaces. Changes to the cell morphology were observed within 4 day in culture under physiological conditions.

BP 16.3 Tue 12:15 HÜL 386

Self-assembled hybrid protein nanofibers as basis for novel biomaterials — •Christian Helbing[1], Tanja Deckert-Gaudig[2], Gang Wei[3], Volker Deckert[2], and Klaus D. Jandt[1] — [1]Chair of Materials Science, Department of Materials Science and Technology, Otto-Schott-Institute of Materials Research, Faculty of Physics and Astronomy, Friedrich Schiller University Jena, Jena, Germany — [2]Institute for Photonic Technology, Jena, Germany — [3]Hybrid Materials Interfaces Group, Faculty of Production Engineering, University of Bremen, Bremen, Germany

Over the last years, the interest in materials consisting of biomolecules arranged in nanofibers increased. There is a special focus on plasma proteins for applications in nanofiber materials because of their high biocompatibility. An easy feasible strategy to create these nanofibers is the self-assembly mechanism of protein molecules. Here we test the hypothesis that novel self-assembled hybrid protein nanofibers (PNNF) can consist of two different proteins. In this work we present, for the first time, self-assembled plasma hybrid PNNF consisting of two different plasma proteins. Further, long-time CD-measurements provide information about the fiber formation dynamics. Especially, for the PNNF hybrid it confirmed interactions between both molecules. Additionally, the influence of the second protein on the properties of the novel hybrid PNNF is shown. We confirmed the existence of a novel PNNF hybrid by tip enhanced raman spectroscopy and immunolabeling. These results lay the foundation for a novel biomaterial based on these PNNF/PNNF hybrids.