Stuttgarter Physikalisches Kolloquium

Fachbereich Physik, Universität Stuttgart
Max-Planck-Institut für Festkörperforschung
Max-Planck-Institut für Intelligente Systeme

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Login data will be announced by e-mail and on the colloquia webpage

Dienstag, 27. April 2021	16:15 Uhr	Online-Vortrag

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Polymeric modules for synthetic biology

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Abstract

Since many years, there is a quest for minimal cells in the field of synthetic biology, potentially allowing a maximum of efficien¬cy in biotechnological processes. Although the so-called “protocells” are usually referred to in all papers that attempt a cumulative definition of Synthetic Biology, research in this area has been largely under-represented. Our aim is at developing vesicular structures, i.e. protocells, based on block copolymer self-assembly and engulfed nanocontainers with incorporated functions, such as energy production and the control of transport properties through nanomembranes. Therefore, we have designed and developed nanocapsules that act as cell-like compartments and can be loaded with enzymes for synthetic biology and chemistry. In addition, self-assembly of well-defined diblock copolymers has been used to generate polymersomes and hybrid liposomes/polymersomes. Both strategies allow the compartimentalization on the nano- or microscale and conducting enzymatic or chemical reactions in the confinement of the polymersomes/ nanocarriers. New block copolymers and permeable nanocarriers have been synthesized and optimized. With these protocols we were able to establish an enzymatic reaction cascade within droplet-based compartments. These confined compartments can act as cell-like functions to regenerate NAD. For these tasks, novel conductive polymer nanoparticles have been developed which will be included into the protocells for the NAD regeneration by light. Enzyme-complexes are assembled that will fulfill these requirements.