PEPTIDE SELF ASSEMBLY CONFERENCE 2026
MAINZ. GERMANY
FROM DYNAMIC STRUCTURES TO FUNCTIONAL MATERIALS

Supramolecular polymer scaffolds for reversible bioconjugation using curcubit[8]uril based dynamic host-guest-chemistry

J. Edling[1], K. Wittek[1], M. Thomas[1], N. Hempel[1], P. Besenius[1]

[1]Department of Chemistry, Johannes Gutenberg-Universität Mainz

Biological systems often rely on switch-like all-or-none responses which are mostly either feedback loops or based on molecular cooperativity. Understanding the underlying mechanisms of RNA splicing events through RNA binding proteins (RBPs) would support the prevention of diseases and enable the design of new switches for numerous biological applications. Our aim is to investigate the supramolecular (bio)conjugation of synthetic host-guest systems in aqueous environment to modulate RNA-protein complexation. Guest components are represented by polymer-peptide conjugates functionalized with phenylalanine-glycine-glycine (FGG) and pentafluorophenylalanine-glycine-glycine (F_5FGG) recognition motifs linked to a polyethylene glycol backbone, whereas curcubit[8]uril serves as host species.[1] The resulting systems show tunable thermodynamic and kinetic properties.[2] This presentation focuses on investigating the impact of F_5FGG-binding in homo- and hetero-complementary complexes as well as the resulting network formation. Elucidating the underlying exchange dynamics is essential for assessing the impact of multivalent host-guest complexation and RNA-protein binding. To probe the formation of supramolecular complexes, the fluorescent protein mCitrine (mCFP) is incorporated into the host-guest network. Thereby a framework for further studies on reversible and suitable RNA binding motifs is established. Our approach to investigate supramolecular assemblies and quantify diffusion kinetics involves a combination of complementary methodologies such as shear rheology and fluorescence correlation spectroscopy (FCS).

[1] X. Chen, *et al*., *J. Am. Chem. Soc.* **144**, 8474 (2022).
[2] Y. Wang, *et al.*, *Adv. Mat.* **36**, 0935 (2024).