Assembly of Molecular Daisy Chains in Water

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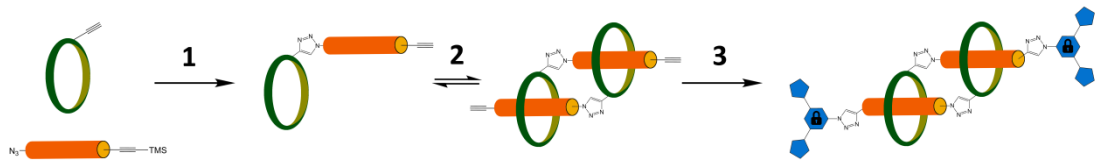
Supramolecular chemistry relies on the recognition between individual molecules, thus requiring recognition motifs with high specificity[1]. Numerous interactions have been applied for the synthesis of self-assembling structures, giving rise to a large structural diversity of mechanically bonded structures such as rotaxanes and catenanes. As a subclass of rotaxanes, daisy chains are particularly appealing for the construction of supramolecular systems owing to the self-complementary nature of their monomers[1]. The most prominent recognition motives in daisy chain synthesis are crown ether-cation- or cyclodextrin-aryl rod-based. Inspired by Diederich et. al. who reported strong complexation of hydrophobic aromatic guests in water by a series of cationic cyclophanes[2,3], our group reported a synthesis towards molecular daisy chains, relying on a Diederich-type cyclophane as host and a hydrophobic oligophenyleneethynylene (OPE) rod as guest[4]. Our ultimate goal is the development of a modular, Diederich-type-cyclophane-based molecular daisy chain-toolbox, which allows for the introduction of functionalities such as redox-active chromophores into the hydrophobic rod component to give daisy chains with switchable dimensions. Current synthetic investigations are directed towards a high-yielding synthesis on of interlocked [c2]-daisy chains which could then be further integrated into mechanically bonded nanostructures.



Three-step assembly of mechanically interlocked [c2]-daisy chains based on Cu^{I}-catalyzed *Huisgen*-azide-alkyne cycloaddition (“click reaction”)

[1] J. Rotzler et al. *Chem. Soc. Rev*. **2013**, *42*, 44-62
[2] D.Griebel et al. *Chem. Ber*. **1985**, *9*, 3588-3619
[3] S.B. Ferguson at al. *J. Am. Chem. Soc*. **1991**, *113*, 5410-5419
[4] J. Rotzler et al. *Chem. Eur. J*. **2013**, *6*, 2089-2101