Photoactive Rosette Nanotubes

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Rosette nanotubes (RNTs) are tubular architectures generated through the hierarchical self-assembly of the guanine-cytosine (G∧C) motifs. These materials have substantial design flexibility and a range of applications. The RNTs can be functionalized with amino acid, peptide, photoactive moieties, polymers or metal nanoparticles. Therefore, these materials can be used for applications in catalysis, photovoltaics and nanomedicne.

Several studies have established their biocompatibility and applications in nanomedicine including as coatings for medical devices, materials for tissue engineering and for drug display and delivery. In order to further explore RNTs for diagnostics / drug delivery, it is necessary to design an efficient synthesis as well as self-assembly protocol, extend the inner channel diameter and introduce intrinsic fluorescence for tracking the RNTs in biological systems. The main goal of this thesis is therefore to design new shorter synthetic strategies for the synthesis of photoactive G∧C modules and develop self-assembly protocol.

The first part of this project is to synthesize and study self-assembly behavior of new G∧C bases **2a-c** which are modeled after Mascal's motif and further functionalization for synthesis of fluorescent tricyclic G∧C motif **3**. The second part is to design new shorter synthesis approach for Lehn type G∧C motif **6**, and its precursor key intermediate for G∧C

oligonucleotide synthesis. The last part is synthesis, self-assembly and characterization of water soluble tetracyclic motif, **yG∧C** for drug delivery. The self-assembly and fluorescent properties of RNTs will be characterized by using scanning electron microscopy (SEM), transmission electron microscopy (TEM), atomic force microscopy (AFM), UV-visible and fluorescence spectroscopy.

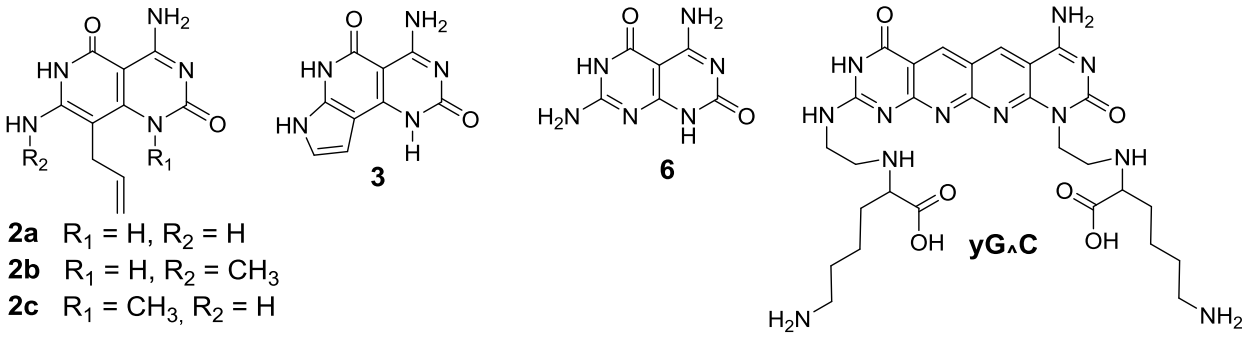

Figure. Structures of G∧C motifs to be synthesized