Tailoring Peptide Self-Assembly with Electron Donor Functionalization Towards Formation of Vesicles, Helical Ribbons, and Fibers

L. Brüchle, T. Heim, F. Thomas*, M. Kivala*

Heidelberg University, Institute of Organic Chemistry,
Im Neuenheimer Feld 270, Heidelberg, Germany
* franziska.thomas@oci.uni-heidelberg.de, milan.kivala@oci.uni-heidelberg.de

We present the synthesis of novel tripeptides functionalized with triarylamine-based donor moieties and their self-assembly in aqueous solutions. After successful synthesis of the amino acids decorated with donor moieties (Figure 1, red), solid-phase peptide synthesis enabled the isolation of a series of tripeptides with different *N*-terminal protection groups (Figure 1, blue). In the series of Fmoc-protected peptides, electron microscopy images revealed that the incorporation of the triphenylamine (TPA)-substituent induced fiber formation, while the bridged *N*-heterotriangulene (*N*-HTA) yielded helical ribbons. For the unprotected peptides, dynamic light scattering measurements detected vesicles with diameters of up to 300 nm, which were visualized by SEM. For the bridged-donor decorated peptide, irradiation with UV-light led to decomposition of the vesicles, presumably due to photochemically induced oxidation of the nitrogen center, which is enabled by a lower oxidation potential compared to parent triphenylamine.[1] Hence, this tripeptide shows promise for cargo transportation in aqueous media.

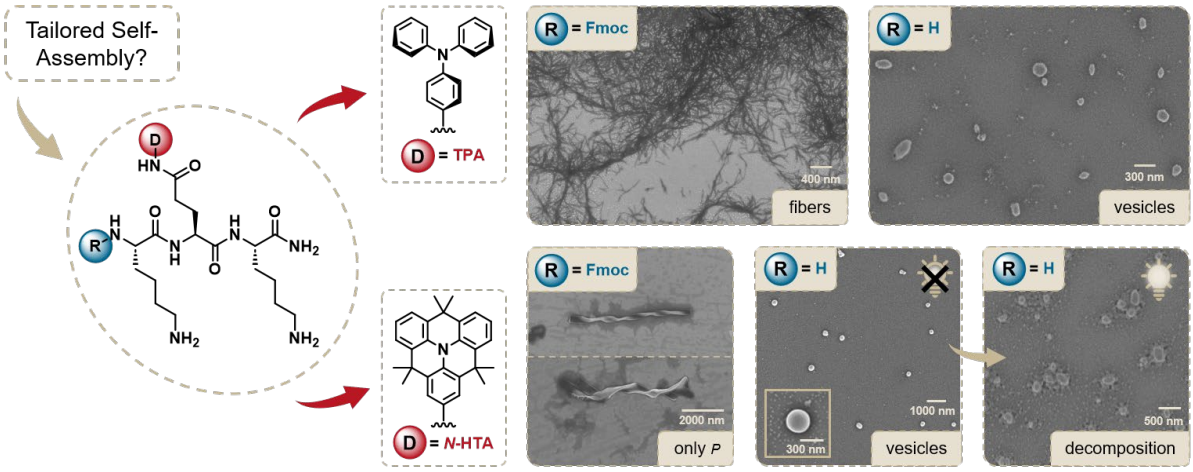

Figure 1: Decoration of tripeptide with distinct triarylamine based donor moieties leads to tailored self-assembly.

References:

[1] N. Hammer, T. A. Schaub, U. Meinhardt, M. Kivala, *Chem. Rec.* **2015**, *15*, 1119-1131.