Supramolecular Nanofibers Based on Heptazine

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Functional supramolecular nanofibers are a topic of high interest, because such self-assembled nano-objects feature unprecedented and outstanding properties, which cannot be observed in the individual molecular building blocks. For example, supramolecular nano-aggregates feature a unique optical and optoelectronic behavior as demonstrated by the formation of supramolecular chromophores [1], nano-objects with super-radiant states [2] and nano-fibers with long-range energy transport [3]. These nanostructures are based on 1,3,5-benzentrisamides, perylenes and carbonyl-bridged triarylamines, respectively, demonstrating that the selection of different π-conjugated cores is decisive for their self-assembly and functionality.

Melon is a polymer based on heptazine, which consists of three fused triazine rings in a triangular fashion. Such carbo nitrides are of high interest for photocatalytic water splitting applications due to their suitable bandgap and good chemical stability [4]. However, well-defined supramolecular nanostructures based on heptazine are not known till date.

Here we demonstrate the synthesis and self-assembly of novel supramolecular building blocks based on heptazine as core. This electron-deficient C3-symmetric core is substituted with chiral and achiral peripheries. Both supramolecular building blocks can be self-assembled into nanofibers via H-bonding and π-π interaction, which feature a length of multiple micrometers and a diameter below 20 nm. These nanofibers may pave the way to potentially more effective photocatalytic activities based on heptazine.

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