Synthesis and self-assembly of interdigitating amphiphiles

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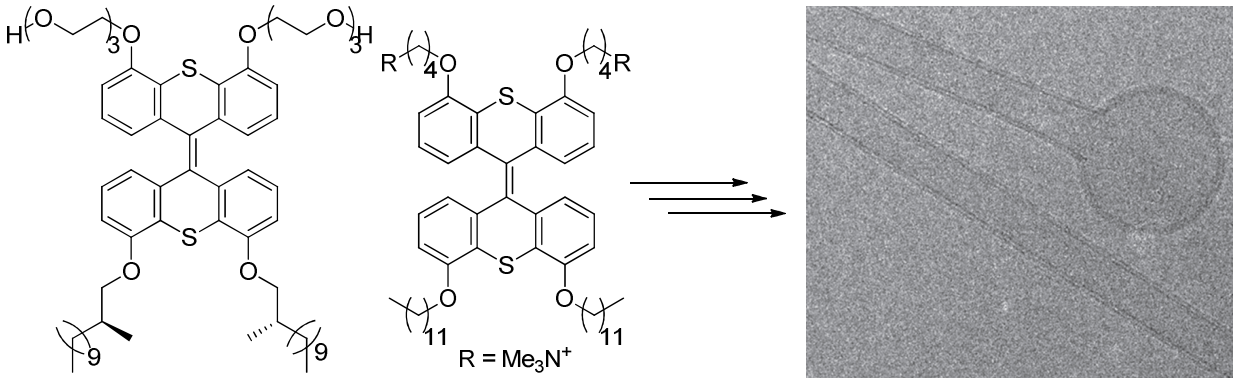
In exploring the frontiers of self-assembly, the spontaneous formation self-assembled multicomponent and functional structures precisely defined at the nanoscale continues to be a major challenge. Recently, an overcrowded alkene based amphiphile that forms DOPC capped nanotubes upon self-assembly has been reported by our group.[1] The nanotubes have been found to be exceptionally stable due to interdigitation of the lipophilic chains. The DOPC vesicle caps could be removed without affecting the nanotubes, while the nanotubes could be disassembled by irradiation with UV light.

In order to gain more insight on how structural modifications affect self-assembly and the morphology of the assemblies, derivatives with different modifications have been prepared. For this purpose, the polar headgroup has been altered and a chiral group has been installed in the lipophilic chain via asymmetric synthesis.

The new derivatives were found to retain the ability to form uniform, thin-walled nanotubes upon self-assembly in water. Although no helical coils or chiral tubes[2] were visible in the cryo–TEM of the chiral amphiphile samples, circular dichroism showed that the nanotubes are chiral, as demonstrated by multiple bands and strong Cotton effects which were absent in the non-assembled sample and the sample disassembled by irradiation at 313 nm. Additionally, nonlinear effects in circular dichroism were observed when mixed with the original, achiral, amphiphile.



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