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DNA-decorated Soft Nanostructures

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Abstract:

DNA based nanostructures is one of the promising class of nanostructures for several biomedical and nanotechnological applications due to their excellent biocompatibility and DNA-directed surface addressability.[1] Amphiphilicity-driven self-assembly is an efficient bottom-up approach for the creation of nanostructures. Recently, DNA has been applied as the hydrophilic segment in the design of DNA based amphiphilic systems.[2] The most attractive feature of the self-assembly of DNA based amphiphiles is the formation of nanostructures with the corona made of hydrophilic DNA. Hence, such nanostructures allow the reversible integration of other functional molecules onto their surface through DNA hybridization.[3]

Our group focus on the design, synthesis and applications of DNA-chromophore hybrid amphiphiles. Herein, we present synthetic approaches we have demonstrated for the synthesis of DNA-amphiphiles.[4] Amphiphilicity-driven self-assembly of the amphiphiles leads to the formation of various nanostructures that are densely surface-decorated with DNA. The morphology of the nanostructures could be tuned by the appropriate selection of the hydrophobic segment of the amphiphile. Our study also revealed that hydrophilic DNA segment has little or no role in dictating the morphology of the resulting nanostructures. The surface addressability of the nanostructure have explored for the surface decoration of the nanostructures with nanoparticle. Surface addressability of the nanostructures have also explored for the design of a thermally gated light harvesting systems. We also demonstrate that the decoration of the surface of the nanostructure with cell targeting ligands allows the specific cancer cell targeting, which may find potential application in the targeted drug delivery applications.

References

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