Synopsis of Original Research Paper

Fabrication of functional hydrogels based on the molecular membrane of amphiphilic gelator

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Nucleic acids have been employed as programmable building blocks in the construction of various DNA nanostructures through self-assembly, which is based on Watson–Crick base pairing. DNA nanostructures with stimuli-responsive properties have been used in various applications such as sensors, controlled release and delivery, and actuators. Here, we describe the design and synthesis of a new reduction-cleavable spacer (RCS) based on a nitrobenzene scaffold for constructing reduction-responsive oligonucleotides according to standard phosphoramidite chemistry. In addition, we demonstrate that the introduction of the RCS in the middle of an oligonucleotide (30 nt) enables the construction of a self-assembled microsphere capable of exhibiting a reduction-responsive disassembly. Since the preparation of RCS-based phosphoramidite reagent for the construction of oligonucleotides containing RCS is straightforward, the RCS could allow for the introduction of the reduction-responsiveness into various functional oligonucleotides and nucleic acid-based architectures toward therapeutic and diagnostic applications in near future.