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Communication

Cyclodextrin/polyethylenimine-based supramolecular nanoparticles for loading and sustained release of ATP

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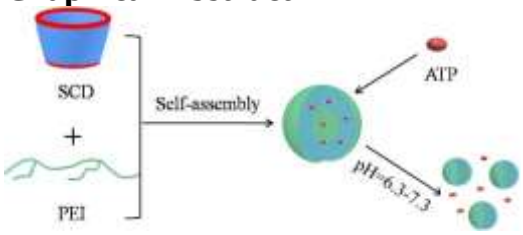
Graphical Abstract



A new supramolecular nanoparticle PEI/SCD was successfully constructed, showing the loading/sustained release abilities towards ATP.

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ABSTRACT

A supramolecular nanoparticle that realized the loading and sustained release of ATP was successfully constructed from sulfato-β-cyclodextrin (SCD) and polyethylenimine (PEI). The assembly and disassembly behaviors of supramolecular nanoparticle were investigated by means of Tyndall effect, UV-vis spectroscopy, dynamic light scattering (DLS), zeta potential and transmission electron microscopy (TEM). Significantly, the resulting nanoparticle was disrupted with the increasing of pH and recovered to the spherical nanoparticle as the pH decreased to initial value. Owing to the positive zeta potential, the supramolecular nanoparticle showed the good loading and sustained release abilities towards ATP.

In recent years, stimuli-responsive assemblies attracted more and more attention due to their prospective applications in the fields of chemistry, biomaterial, and biomedical [1-6]. Among them, supramolecular assemblies have the superiorities of simple construction, controllable assembling behavior, and tunable response to various external stimuli including enzyme, pH, light, temperature or other factors [7-14]. Recently, a variety of charged macrocyclic hosts, including cyclodextrins [15-17], pillararenes [18-20], calixarenes [21, 22] and so on, have been widely reported able to construct supramolecular assemblies through electrostatic interactions with guests and lowered the critical aggregation concentration (CAC), and supramolecular assemblies with pH-responsive properties can provide a new pathway to design effective carriers of biologically important matter [23-26]. Hruby *et al.* reported an efficient pH-sensitive nanocontainer employing Eudragit L100-55 and nonionic surfactant Brij98 to realize the loading of trypsin [27]. Wang *et al.* reported a pH-responsive supramolecular vesicle based on water-soluble pillar[6]arene,

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