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Smart materials

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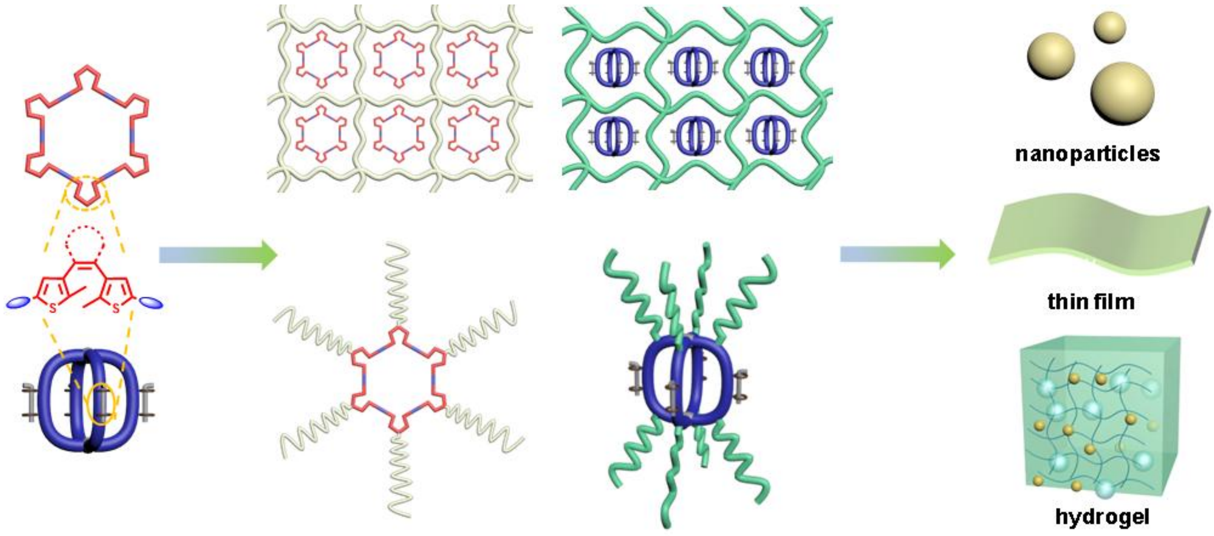
Smart materials based on the diarylethene (DAE)-based supramolecular metallacycles and metallacages have become an evolving field of important interest[1]. In an excellent review by Qin *et al.*[2], the authors comment on the construction, photophysical and photochemical properties, and the applications of such smart materials [Scheme 1].

Integrating DAE subunits into a supramolecular coordination complex including metallacycle and metallacage can lead to smart materials with unique properties such as photo-responsive guest encapsulation/release, photo-controlled supramolecular transformation, and light-induced chirality switching[3,4]. Modulating coordination bonds could regulate the photochromic property of the DAE subunits such as photoconversion yield and enhanced fatigue-resistant property to some extent[5]. Smart materials with photochromic property could be applied to molecular machines, photodynamic therapy, and many other areas. If the synthesis and fundamental photophysical investigation of smart materials based on DAE-based metallacycles and metallacages made dazzling progress, their application needs more attention. For example, metallacages with photo-responsive guest encapsulation/release behavior may show interesting photo-controlled drug delivery ability, which could reduce the side effects of drugs and achieve precise theranostics[6]. The metallacycles and metallacages with photoswitchable fluorescence/magnetism could be applied in erasable molecular devices and in anti-counterfeiting[7]. The current DAE-based metallacycles and metallacages still have some drawbacks such as being fragile, not being solution processable, and being biologically incompatible, hampering further practical applications; new methods



Scheme 1. Schematic representation of the noncovalent and covalent linkage of diarylethene-based metallacycles and metallacages with polymers and the subsequent formation of smart materials.

should be developed to address this issue. As polymers with unique properties and functions are easily processed and shaped[8], two general ways to further promote the applications of DAE-based metallacycles and metallacages in smart materials can be envisioned. The noncovalent linkage between the metallacycles or metallacages with the polymers will be the first choice. For example, doping the metallacycles or metallacages into the polymer matrix to form hydrogels or thin films or encapsulating the metallacycles or metallacages into amphiphilic polymers to form nanoparticles. The construction of polymer-functionalized metallacycles and metallacages (pre-modification and post-modification are both feasible) will become at second place[9]. Through integrating DAE-based metallacycles and metallacages and polymers into one entity, their further applications in smart materials could be realized. Such supramolecular synthetic chemistry will, without doubt, promote the development of modern material science.

DECLARATIONS

Authors' contributions

The author contributed solely to the article.

Availability of data and materials

Not applicable.

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Conflicts of interest
The author declared that there are no conflicts of interest.

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Not applicable.

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Not applicable.

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