Metal Induced Self-Assembly of Redox-Responsive Organic Tectons

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The ability to control the organization of molecules within supramolecular self-assembled systems has become a major scientific objective over the past few years.[1] This increasing attention can be easily explained by the large variety of applications currently envisioned for adaptive/self-healable dynamic supramolecular assemblies in material science, catalysis, sensing and electronics.[2] From a practical standpoint, such responsivity has so far mainly been achieved using light, temperature or pH as input signals. In contrast, far less progress has been made in these directions with electron-responsive systems, even though electrochemistry is known to be particularly attractive as a trigger in the perspective of applications in solid-state devices or to avoid the risks of bleaching associated to high-energy light irradiations. [3-4]

Related to this issue, our group has had a longstanding interest in electron-triggered molecular or supramolecular metamorphic processes involving π-radicals as key redox-responsive elements. [5]

In this communication, we will describe a novel approach towards redox-responsive metal-organic assemblies involving viologen-based tectons. The latter are made up of a viologen unit functionalized by suitable coordinating units. We will show that these monomers self-assemble in solution in the presence of palladium ions to form a wide range of metal-organic complexes whose dissociation can eventually be actuated by electrochemical reduction of the viologen units. The dynamic properties and structures of these redox-responsive molecular systems will mainly be discussed on the ground of electrochemical, spectroelectrochemical and ^{1}H NMR experiments.

Figure 1 Stimuli-responsive metal-organic assembly.

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