

Viologen π -Dimerization as a Trigger for Metamorphism in Supramolecular Stimuli-Responsive Materials

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Abstract:

The key elements in the development of nanoscience are to observe, modify and control matter at the nanoscale. One strategy proposed to meet these immense challenges is to develop responsive molecular or supramolecular systems for which a structural reorganization is obtained when exposed to an external stimulus: this phenomenon is known as *metamorphism*. Systems that endure structural changes leading to major modification of macroscopic properties are of great interest for the controlled capture and release of guest molecules, the development of molecular machines and molecular electronics.

The strategy developed at the Chemistry Laboratory of ENS Lyon is to exploit the switching and assembly properties of π -conjugated organic radicals that can be generated in-situ by electrical or light excitation.¹⁻³ This concept is based on molecular or supramolecular engineering strategies aiming at promoting the formation of π -dimers in solution under usual conditions of temperature and concentration. A first approach consists in favoring the formation of π -dimers inside cavitands molecules such as cucurbit[8]uril in order to control the reversible association/dissociation of molecular building blocks into 2D-supramolecular assembly.¹ Another approach consists in connecting viologen subunits by labile coordination bond or with mobile covalent linker in order to guide and facilitate an electron-transfer triggered switching.^{2,3} These strategies are very promising for the development of new soft-materials such as gels with switchable properties.³

Keywords: viologen, π -dimerization, metamorphism, metamorphism, spectroscopy, electrochemistry, stimuli-responsive materials, supramolecular gels.

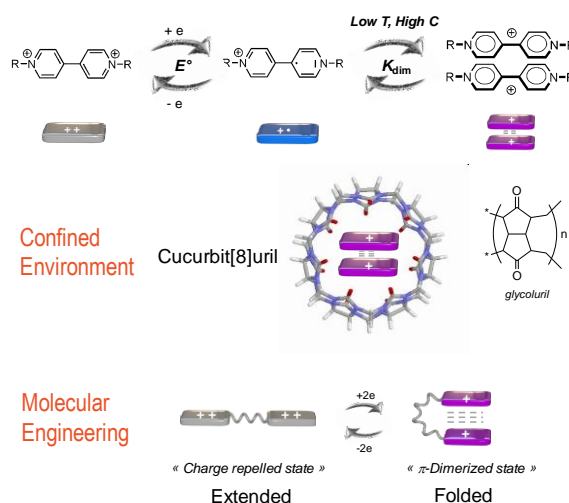


Figure 1: Figure illustrating the π -dimerization of viologen derivatives.

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