Photon-Working Regulation of Photochromic Properties of Diarylethenes

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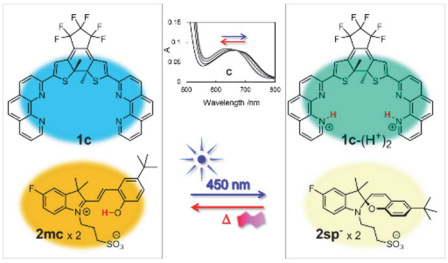
The regulation of the properties of photochromic molecules by synergetic intermolecular interactions with the second photochromic species is of great interest.
In this presentation, our recent research results including the following will be introduced.

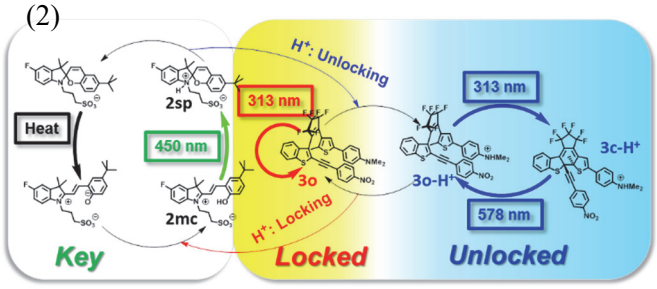
(1) Continuous control of the position of the absorption maximum wavelength in the visible region of a diarylethene by the photochromism of a second photochrome.[1]

(2) Activation and suspension of the thermally irreversible photochromic properties of diarylethenes by the photochromism of a second photochrome.[2]

(1)



(2)



(1) Irradiation of 450 nm light to **2mc** generates **2sp**, which transfers a proton to **1c**. The absorption maximum wavelength of **1c**-$(H^+)_2$ is longer than that of **1c**. Thus, the apparent absorption spectrum which is composed of those of **1c** and **1c**-$(H^+)_2$ behaves as if it shifts from shorter to longer wavelengths as irradiation continues. When irradiation is stopped, **2sp** reverts back to **2mc** which takes back a proton from **1c**-$(H^+)_2$ so that the shift in the absorption band returns to the original wavelength of **1c**.

(2) Diarylethene **3o** is not photochromic in acetonitrile. However, when a proton released from **2sp** generated from **2mc** by 450 nm light irradiation attaches to the nitrogen atom of **3o**, it becomes photochromic. Upon 313 nm light irradiation to **3o**-H^+, it generates **3c**-H^+, and reverts to **3o**-H^+ by 578 nm light irradiation. When **2sp** becomes **2mc** thermally, it takes back the proton from **3o**-H^+ so that it again becomes non-photochromic.

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References:

[1] S. Kusumoto, T. Nakagawa, Y. Yokoyama, *Adv. Opt. Mater.* **2016**, 4, 1350.
[2] S. Mahvidi, S. Takeuchi, S. Kusumoto, H. Sato, T. Nakagawa, Y. Yokoyama, *Org. Lett.*, **2016**, 18, 5042.