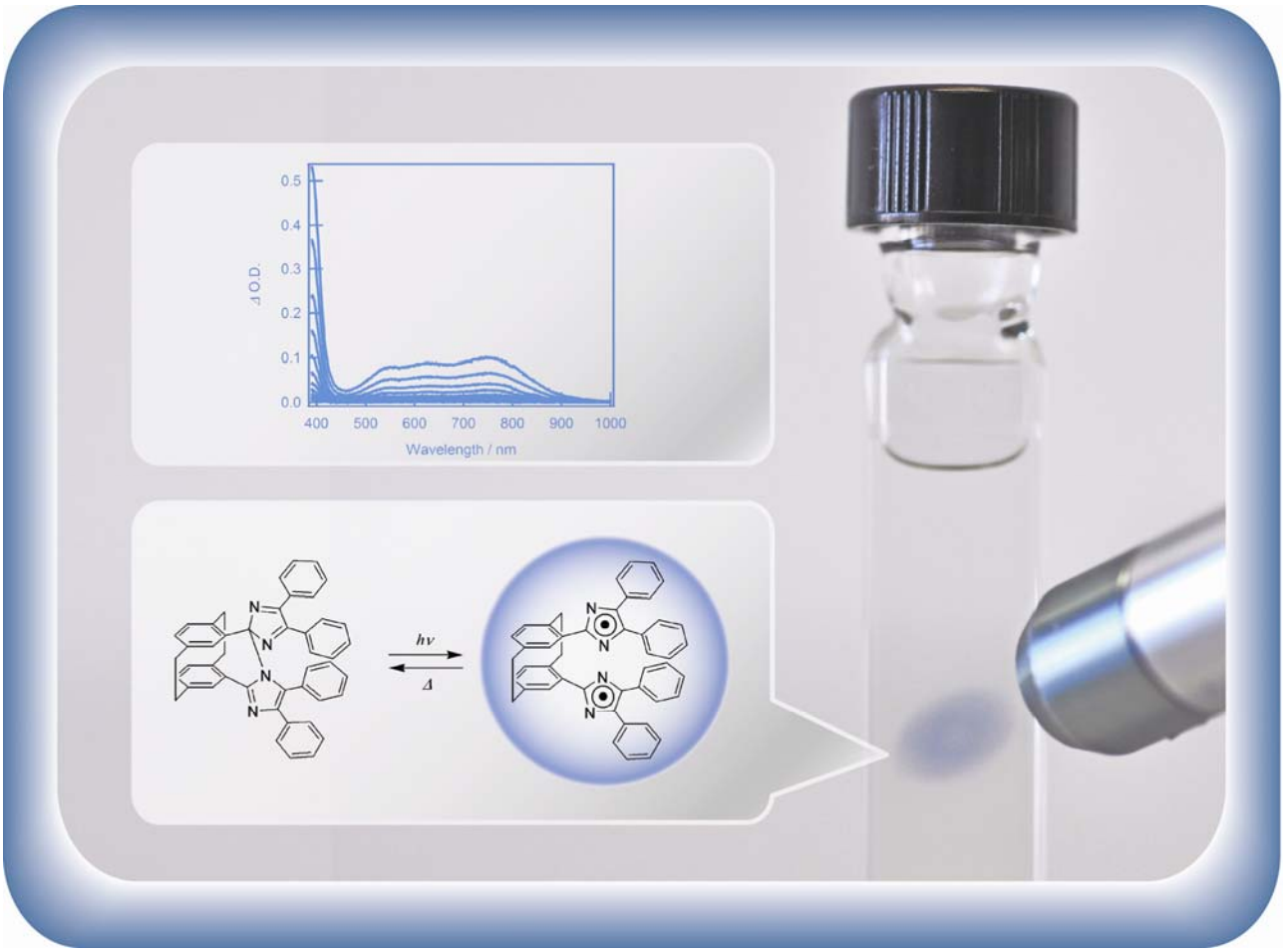
Rapidly Color-Switching Photochromic compounds

Kanto Reagents



Features

***pseudogem*-BisDPI[2.2]paracyclophane derivatives have excellent photochromic characteristics.**

1. Rapid Color-Switching

2. High Fatigue Resistance

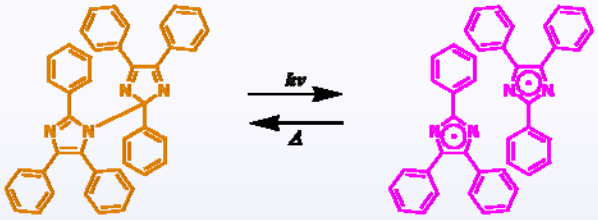
3. Photochromism at a Wide Range of Temperature

Product Introduction

Photochromic materials change their colors upon irradiation with light. The main possible application of photochromic materials has been thought as use in optical data storages, hologram materials and light modulators. There have been considerably researches and studies about photochromic compounds.

There are 2 types of photochromic compounds, P-type and T-type. The photogenerated P-type compound can be converted back to its initial structure by irradiation with a specific wavelength of light. Meanwhile, the photogenerated T-type compound can be converted back to its initial structure thermally. However, the thermal bleach reaction of photogenerated T-type compounds requires several minutes at room temperature, and for practical use in certain applications, it demands a much faster speed in the return to the initial state.

Hxaarylbisimidazole (HABI) was discovered in the early 1960s by Hayashi and Maeda, and it has subsequently attracted significant interest because of its unusual physical properties. The solution of HABI changes from colorless to purple under UV irradiation. The thermal transformation of TPIRs to HABI requires several minutes at room temperature.

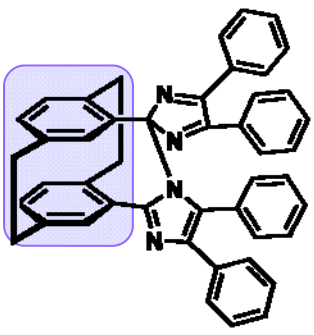


HABI TPIRs

Kanto Chemical has commercialized ***pseudogem*-Bis(diphenylimidazole) [2.2] paracyclophane (1)** and ***pseudogem*-Bis(3,3', 4,4' - tetramethoxydiphenylimidazole)[2.2]paracyclophane (2)** novel hexaarylbisimidazole (HABI) derivatives which have a [2.2]paracyclophane structure. This novel compounds are originally designed and synthesized by professor Abe from Aoyama Gakuin University. These compounds have an excellent color switching character. They are colorless when dissolved in benzene, and change to blue or green upon UV irradiation. After the irradiation ceases, these color bleaches immediately.

◆ *Molecular structure*

1



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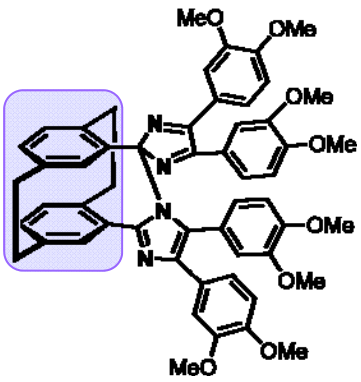
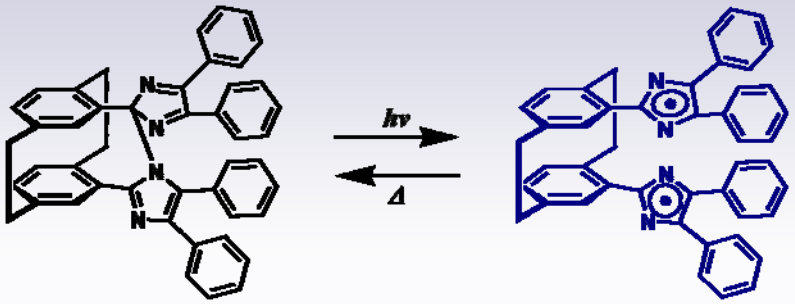


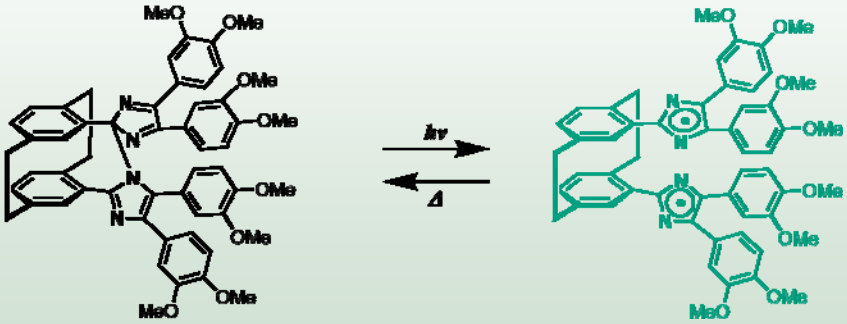
◆Photochromic reaction of 1 and 2

◆ Photochromic reaction of 1.



1 1R

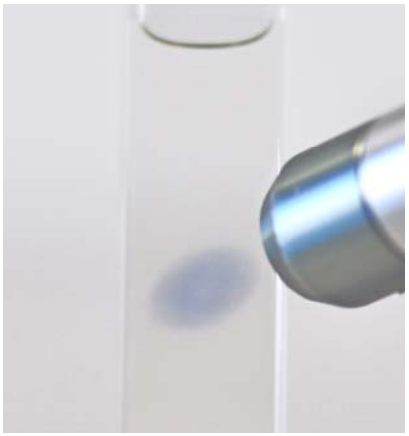
◆ Photocromic reaction of 2



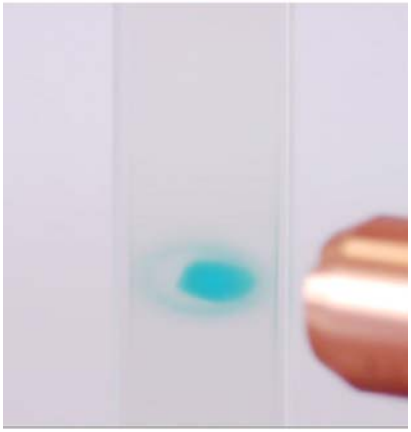
2 2R

◆1 and 2 dissolved in benzene change there color upon UV irradiation

1



2



Solv. : Benzene
Concentration : 0.1～0.5mM
Temperature : 20℃,
Quartz Cell : 1mm × 10mm × 40mm,

UV irradiator : Keyence UV-400
UV-LED(UV-50H) / UV-L6,
Exciting light : (Wavelength) 355nm, (Intensity) 300mW/cm^2

◆ *Transient vis-NIR absoraption spectra and Decay profile of 1*

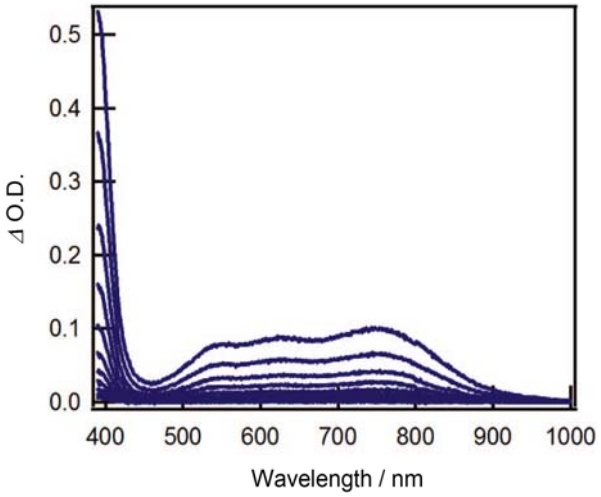


Figure 1
Transient vis-NIR absorption spectra of 1 in de-gassed benzene after excitation with a nanosecond laser pulse.(Conc. 2.1 x 10^{-4}M, 298K, recorded at 20ms intervals).

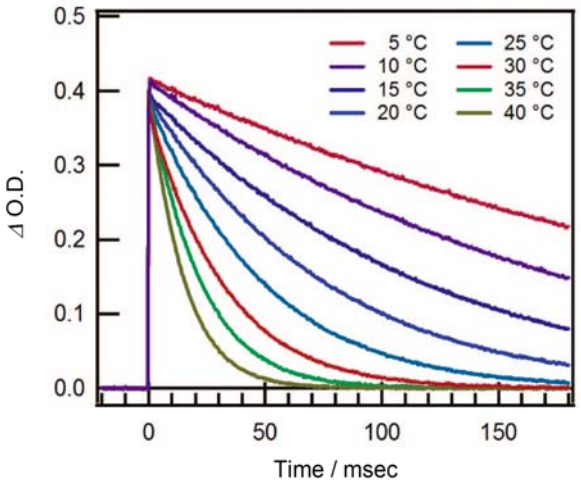
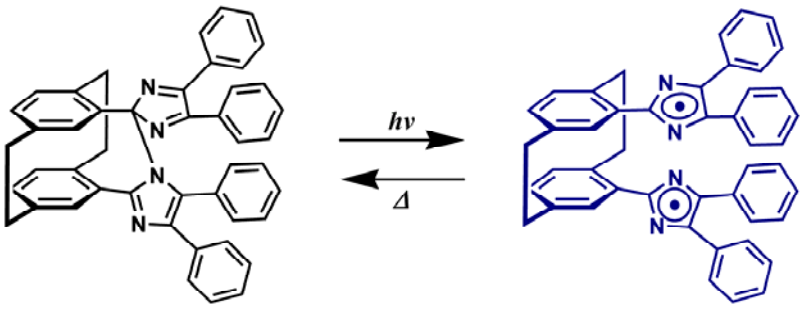


Figure 2
Decay profiles of the colored species generated from 1, monitored at 400 nm in degassed benzene (Conc 1.5×10^{-4}M).



1 **1R**

◆ *The photochromic properties of a polymer film doped with 1.*

A transparent amorphous polymer film of 1 also shows fast thermal bleaching of the photochromic reaction at room temperature. Moreover, the photochromic properties of a poly(methyl methacrylate) (PMMA) film doped with 20 wt %-1 have an excellent fatigue resistance. The practical application of 1 has been highly expected.

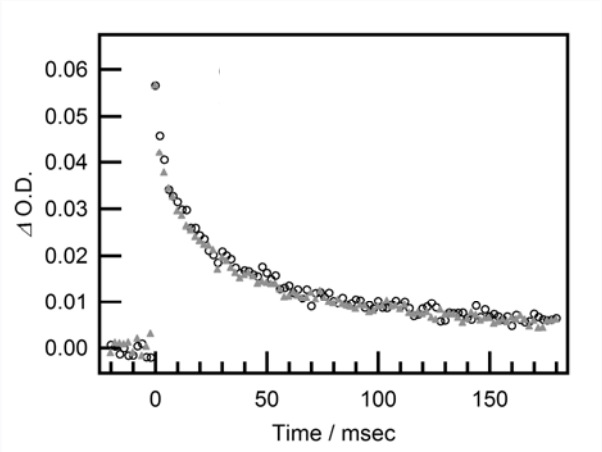


Figure 3
Time profiles of the transient absorbance at 400nm of the PMMA film doped with Conc. 20 wt %-1, measured at 298K (○, freshly pre-pared sample; ▲, after irradiation with 10,000 laser pulses).

◆ Transient vis-NIR absoraption spectra and Decay profile of 2

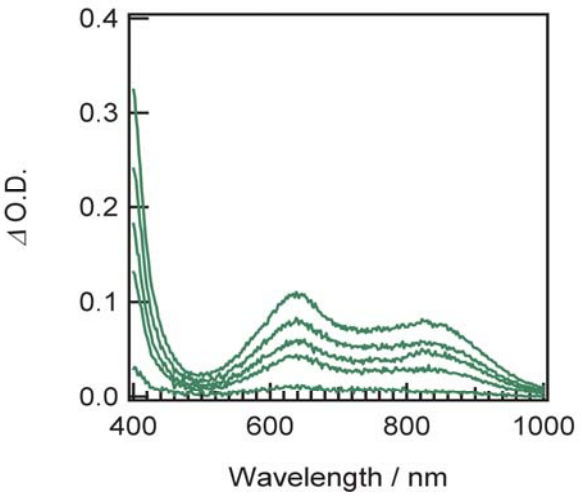


Figure 4
Transient vis-NIR absorption spectra of 2 in degassed benzene after excitation with a nanosecond laser pulse. (2.1 x 10^{-4}M, 298K, recorded at 20ms intervals).

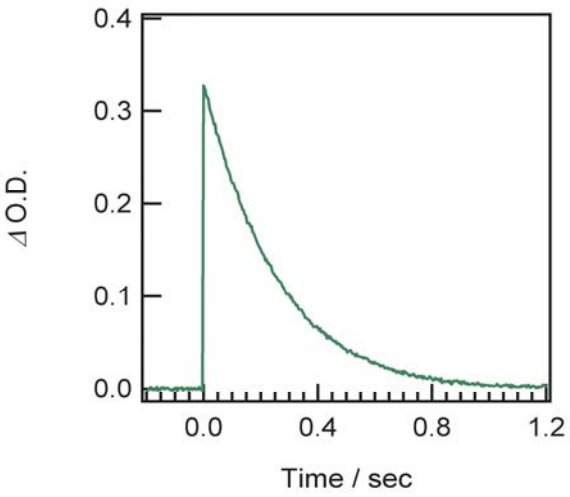
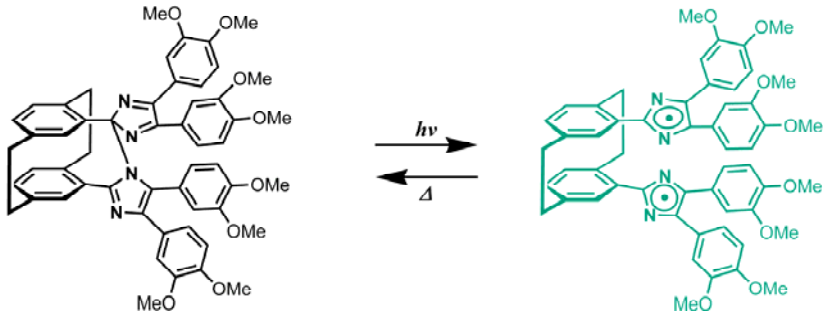


Figure 5
Decay profiles of the colored species generated from 2, monitored at 400 nm in degassed benzene (1.5×10^{-4}M).



2 **2R**

◆ Decay profiles of 1 and 2

The half-life of 1R is 33 ms at 25 ℃
The half-life of 2R is 173 ms at 25 ℃

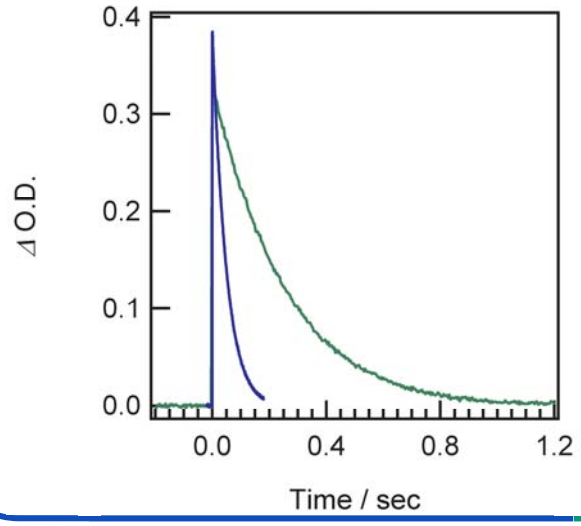
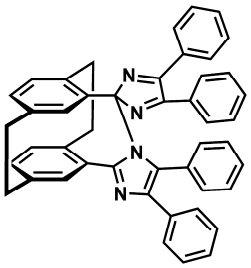


Figure 6
Decay profiles of the colored species generated from 1 and 2, in degassed benzene.

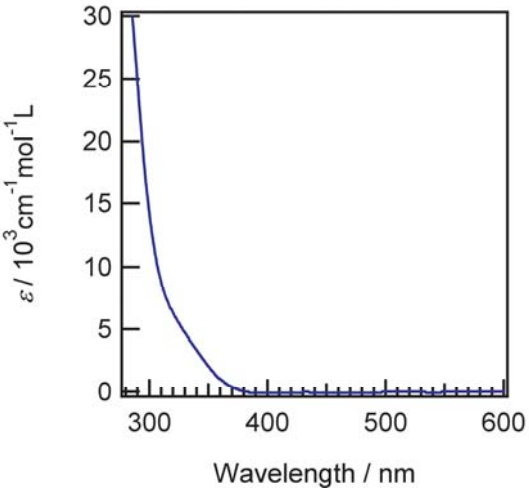
◆UV-Vis absorption spectrum of 1 and 2

2 shows relatively strong absorption band in the UVA radiation region.

1



Solv. ：benzene
Conc. 2.1 x 10^{-4}M
Temp：25℃



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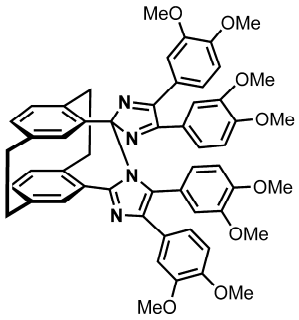
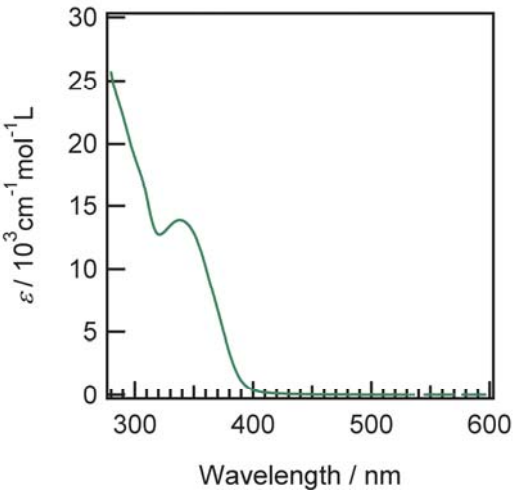
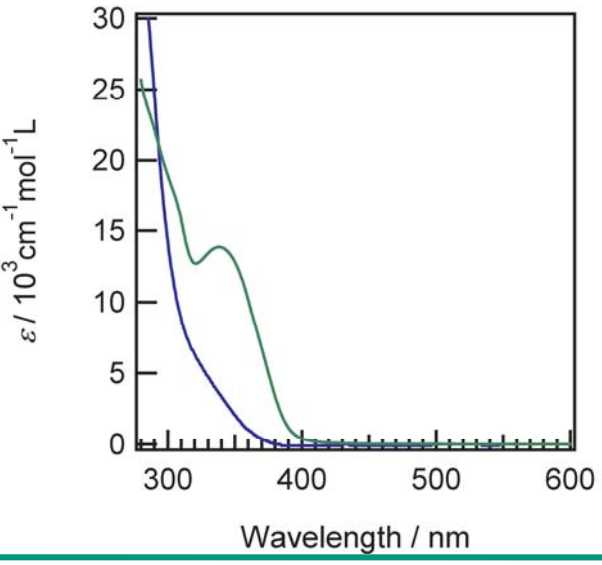
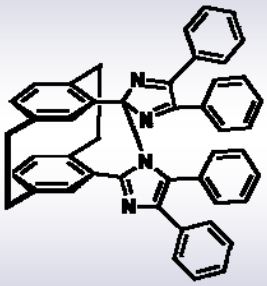
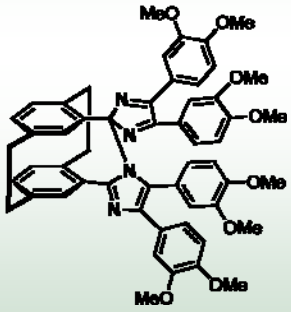


Solv ：benzene
Conc. 2.1 x 10^{-5}M
Temp：25℃





Product List

Product	Cat. No.	Package
pseudogem-Bis(diphenylimidazole)[2.2]paracyclophane (**1**) FW 672.79･46.07 / $C_{46}H_{34}N_4･C_2H_5OH$ Purity: >98%  *1*	04425-96	100mg
	04425-95	500mg
NEW *pseudogem*-Bis(3,3',4,4'-tetramethoxydiphenylimidazole)[2.2]paracyclophane (**2**) FW 883.00 / $C_{54}H_{50}N_4O_8$ Purity: >98%  *2*	04426-68	100mg
	04426-95	500mg

Reference

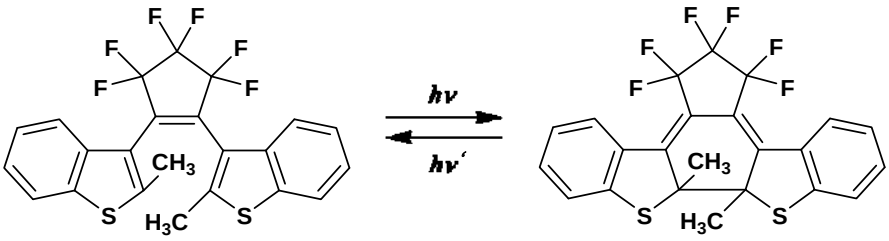
1) Y. Kishimoto, J. Abe, "A Fast Photochromic Molecule That Colors Only under UV Light", *J. Am. Chem. Soc.*, **131**, 4227 (2009)

2) K. Mutoh, S. Hatano, J. Abe, "An Efficient Strategy for Enhancing the Photosensitivity of Photochromic [2.2]Paracyclophane-Bridged Imidazole Dimers" *J. Photopolym. Sci. Technol.*, **23**, 301 (2010)

Relative Products －Diarylethene－

Kanto Chemical has commercialized a typical P-type photochromic compound, diarylethene, which was developed by professor Irie from Rikkyo University.

Product	Cat. No.	Package
1,2-Bis(2-methylbenzo[b]thiophene-3-yl)perfluorocyclopentene (**3a**) FW 468.48 / $C_{23}H_{14}F_6S_2$ Purity: >96%	05058-63	100mg
	05058-96	500mg



3a *Colorless* **3b** *Red*

- Please use the products listed in the catalog as reagents (chemicals used for testing or research purpose).
- Product information is subject to change without notice. For the latest information, please have a look at our website "Cica-Web".

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