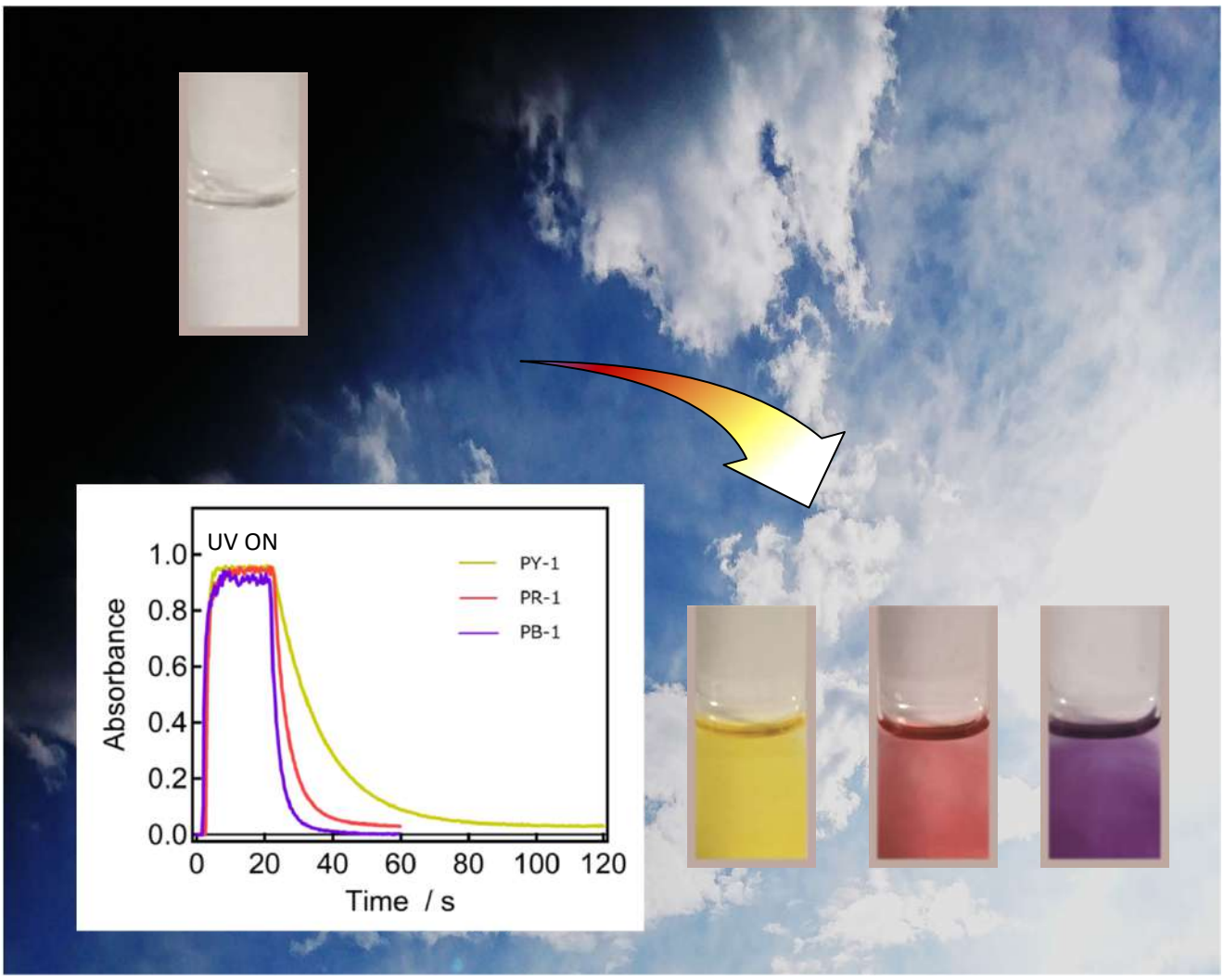
Rapidly-Switching Photochromic Dye

ver3.0



Photochromism is the phenomenon which are accompanied by a color changes by isomerizes reversibly between two forms which have different absorption spectra by irradiation. Kanto Chemical has commercialized novel photochromic dyes which are originally designed and synthesized by Professor. Jiro ABE from Aoyama Gakuin University.

Excellent photochromic characteristics.

1. *Rapid Color-Switching*

2. *High Durability*

3. *Reactivity with Sunlight*

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.

The 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.

Kanto Chemical has commercialized pseudogem-Bis(diphenylimidazole) [2.2]paracyclophane and pseudogem-Bis(3,3,4,4'-tetramethoxydiphenylimidazole)[2.2]paracyclophane novel hexaarylbisimidazole (HABI) derivatives which have a paracyclophane structure so far. These novel compounds are originally designed and synthesized by Professor. Jiro ABE from Aoyama Gakuin University.

Kanto Chemical are pleased to announce to commercialize PY-1, PR-1 and PB-1 which have entirely new backbone, and it changes color and bleaches upon the sunlight. It changes color and bleaches upon the sunlight unlike the hexaarylbisimidazole (HABI) derivatives. They are colorless when dissolved in toluene, and change to Yellow(PY-1), Red(PR-1) or Blue(PB-1) upon the sunlight. After the blocking the sunlight, these color bleaches immediately.

PY-1, PR-1 and PB-1 dissolved in toluene change their color upon UV irradiation(365nm),

PY-1(Yellow)

PR-1(Red)

PB-1(Blue)

Solvent: Toluene
Concentration: 5.5×10^{-5} M
Temperature: 20 ℃,
Quartz Cell: 1 mm × 10 mm × 40 mm,
Exciting light: (Wavelength) 365 nm, (Intensity) 400 mW/cm^2

UV irradiator: Keyence UV-400
UV-LED(UV-50H) / UV-L6

Transient vis-NIR absorption spectra and Decay profile of PY-1(Yellow).

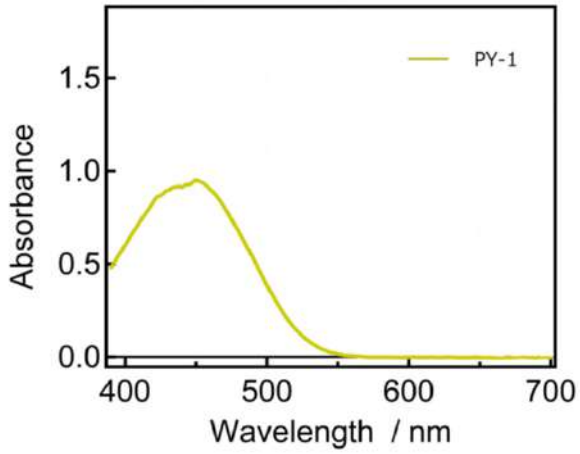


Figure 1
Transient vis-NIR absorption spectra in toluene after UV irradiation(365nm)

Concentration : 5.5×10^{-5} M
Exciting light : (Wavelength) 365 nm
(Intensity) 400 mW/cm^2
Temperature : 25 ℃

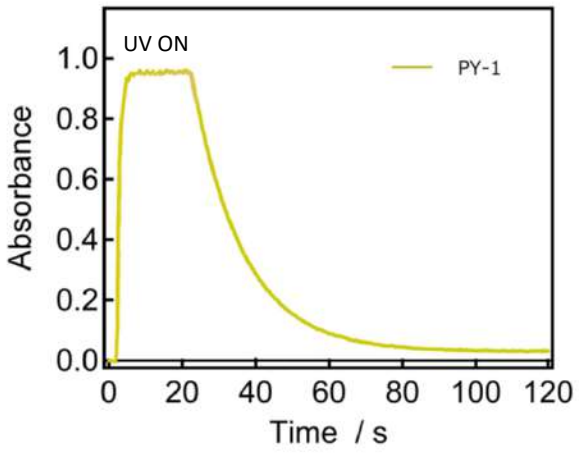


Figure 2
Absorbance change on the maximum absorption wavelength in toluene before and after UV irradiation (365nm)

Concentration : 5.5×10^{-5} M
Exciting light : (Wavelength) 365 nm
(Intensity) 400 mW/cm^2
Temperature : 25 ℃
Irradiation time : 20 seconds

Transient vis-NIR absorption spectra and Decay profile of PR-1(Red).

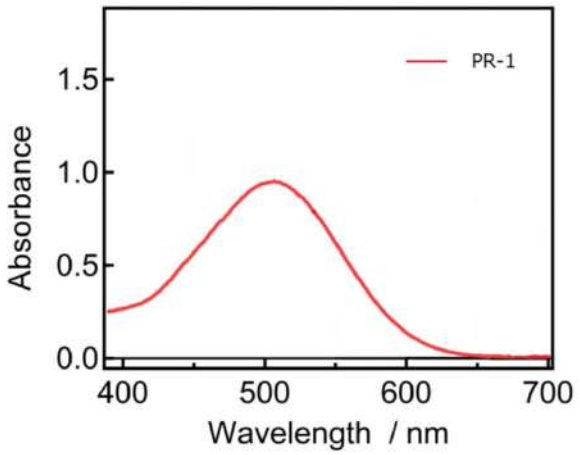


Figure 3
Transient vis-NIR absorption spectra in toluene after UV irradiation(365nm)

Concentration : 5.5×10^{-5} M
Exciting light : (Wavelength) 365 nm
(Intensity) 400 mW/cm^2
Temperature : 25 ℃

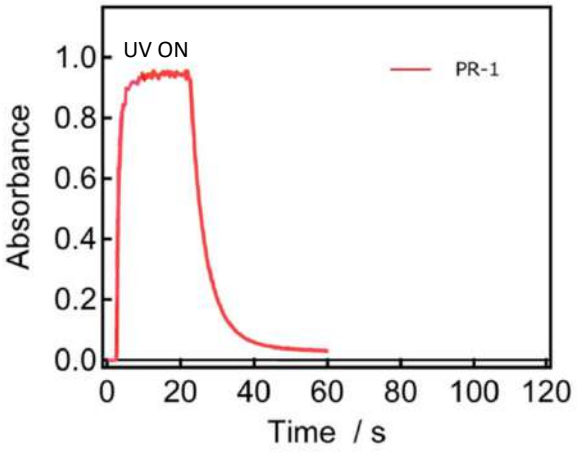


Figure 4
Absorbance change on the maximum absorption wavelength in toluene before and after UV irradiation (365nm)

Concentration : 5.5×10^{-5} M
Exciting light : (Wavelength) 365 nm
(Intensity) 400 mW/cm^2
Temperature : 25 ℃
Irradiation time : 20 seconds

Transient vis-NIR absorption spectra and Decay profile of PB-1(Blue).

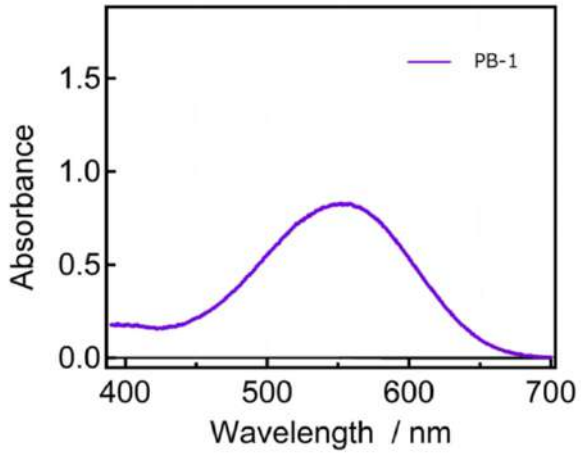


Figure 5
Transient vis-NIR absorption spectra in toluene after UV irradiation(365nm)

Concentration : 5.5×10^{-5} M
Exciting light : (Wavelength) 365 nm
(Intensity) 400 mW/cm^2
Temperature : 25 ℃

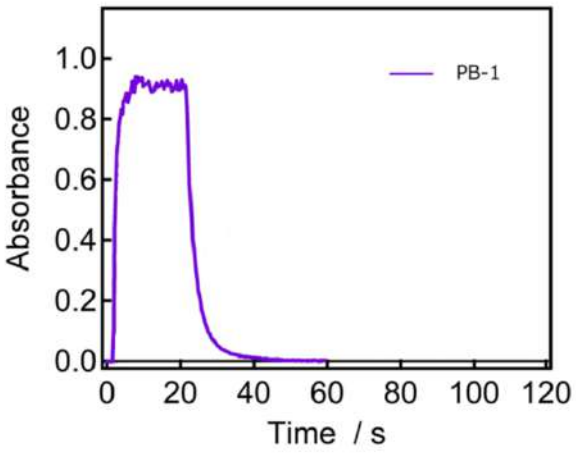


Figure 6
Absorbance change on the maximum absorption wavelength in toluene before and after UV irradiation (365nm)

Concentration : 5.5×10^{-5} M
Exciting light : (Wavelength) 365 nm
(Intensity) 400 mW/cm^2
Temperature : 25 ℃
Irradiation time : 20 seconds

Absorbance changes on the max. abs. wavelength PY-1, PR-1 and PB-1 dissolved in toluene before and after UV irradiation (365nm)

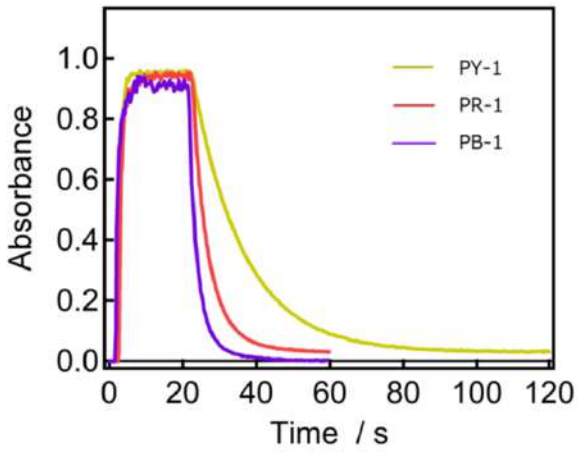


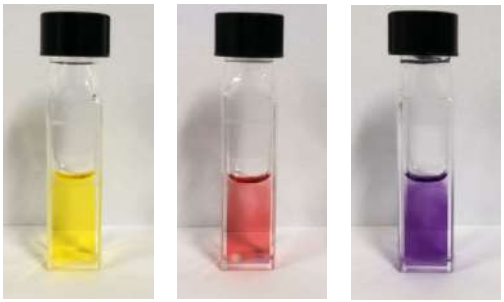
Figure 7
Transient vis-NIR absorption spectra in toluene after UV irradiation(365nm)

Concentration : 5.5×10^{-5} M
Exciting light : (Wavelength) 365 nm
(Intensity) 400 mW/cm^2
Temperature : 25 ℃

≪Comparison Absorbance changes≫

Half-life PY-1 (25℃)	9 seconds
Half-life PR-1 (25℃)	3 seconds
Half-life PB-1 (25℃)	1.7 seconds

PY-1 PR-1 PB-1



Transient vis-NIR absorption spectra and Decay profile of PY-1 and PB-1 dissolved in toluene.

PY−1 and PB−1 dissolved in toluene（1.6×10^{-4} M）, mix with 2:3 of PY1− and PB−1 dissolved in toluene and evaluate it.

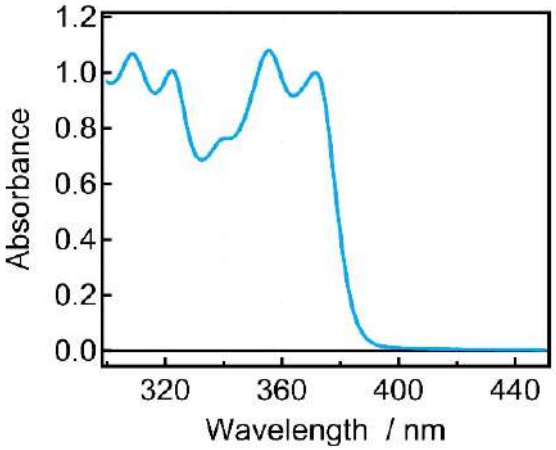


Figure 8 UV−Vis absorption spectra of mixture

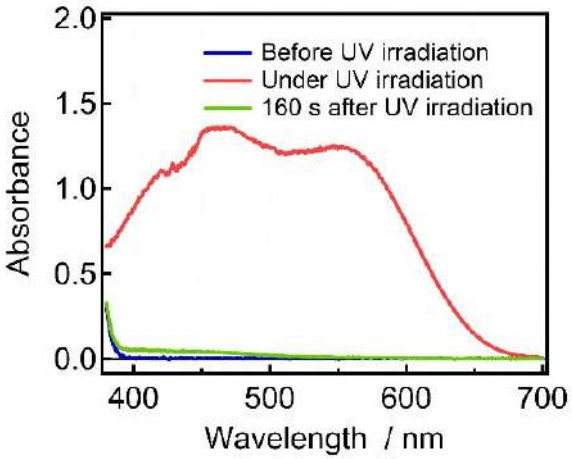
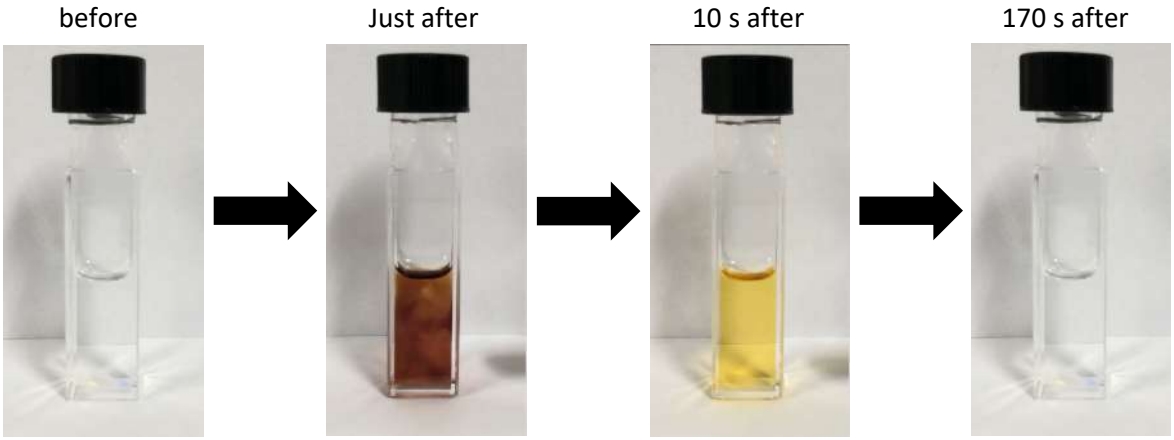


Figure 9 Transient vis−NIR absorption spectra pf mixture

Although the mixture shows the absorption spectra which is spread in the visible region of the spectrum under the photostationary state and changes color to dark brown, it shows the Yellow for a while after the UV irradiation because of the difference of the both rates of heat of reaction of PY−1 and PB−1.

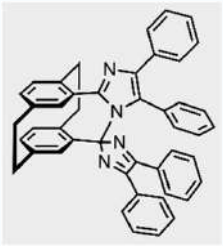
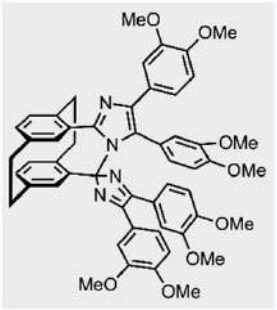


Product List

Product	Cat. No.	Package
PY−1	04780−68	100mg
PR−1	04632−68	100mg
PB−1	04609−68	100mg

Relative products - Cross-linking hexaarylbisimidazole (HABI) derivatives -

Kanto Chemical has commercialized hexaarylbisimidazole (HABI) derivatives which have a [2.2] paracyclophane structure which are originally designed and synthesized by Professor Jiro ABE from Aoyama Gakuin Universtiy.

Product	Cat. No.	Package
pseudogem-Bis(diphenylimidazole)[2.2] paracyclophane 	04425-96	100mg
	04425-95	500mg
pseudogem-Bis(3,3',4,4'-tetramethoxydiphenyl-imidazole)[2.2]paracyclophane 	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(Past affiliation: Kyusyu University).

Product	Cat. No.	Package
1,2-Bis(2-methylbenzo[b]thiophene-3-yl) perfluorocyclopentene	05058-63	100mg
	05058-96	100mg

- 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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