Supporting Information

Reversible Fluorescence Wavelength Shift Based on Photoinduced Aggregate Formation

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**Temperature Dependence of Aggregate Formation**

Absorption spectra in MCH (10^{-5} M) were recorded as a function of temperature in the range between 90 °C and 0 °C, with heating steps of 10 °C (Figure S1). The absorption bands corresponded to the aggregate disappeared at higher temperature. The spectral change upon heating was fully reversible.

Fluorescence spectrum of **1a** showed a significant red shift upon aggregation. Upon heating, the broad fluorescence band due to the aggregate disappeared and the sharp fluorescence band with fine structure appeared. (Figure S2). The fluorescence spectral change was also fully reversible.
Figure S1. Temperature dependence of absorption spectra in MCH solution. Concentration of 1 was $1.2 \times 10^{-5}$ M.

Figure S2. Temperature dependence of fluorescence spectra in MCH solution. Concentration of 1 was $1.2 \times 10^{-5}$ M.
**Photochemical Effects of Fluorescence Lifetime**

The change of fluorescence decay images with photochromic reaction was shown in Figure S3. Monomer and aggregate fluorescence components were observed in open-ring isomer. Upon irradiation with UV light, the population of aggregate component became small in photostationary state. The ratio of monomer and aggregate components changed reversibly with photochromic reaction.

![Fluorescence lifetime images and corresponded fluorescence spectra](image)

Figure S3. Fluorescence lifetime images and corresponded fluorescence spectra of 1 excited with 337 nm light. Concentration of 1 was $1.2 \times 10^{-5}$ M: (a) open-ring isomer and (b) photosationary state.
MO calculation

The electronic density change of 1 was estimated by the MO calculation (Win MOPAC, AM1). The electronic density of 1a and 1b at HOMO level is shown in Figure S4. The results suggested that the electronic density at maleimide moiety of the diarylethene unit was affected by photoisomerization.

Figure S4. The electronic density changes of 1 at HOMO level upon photoisomerization.