

Suppression of Formation of Long-Lived Transoid-Trans Colored Form of Naphthopyran Derivatives by Simple Substitutions

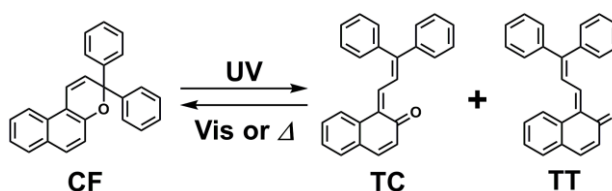
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Naphthopyrans (NPs) are one of the T-type photochromic compounds which generate the two colored isomers, *transoid-cis* (TC) and *transoid-trans* (TT) forms upon UV light irradiation (Scheme 1) and are applied to

Scheme 1. The photochromic reaction scheme of 3*H*-naphthopyran.



ophthalmic lenses in industry because of their excellent durability. The photogenerated TC form thermally reverts to the original closed form (CF) with a time scale of seconds to tens of seconds, whereas the thermal back reaction from the TT form to the CF usually takes minutes to hours.^[1] The residual color due to the TT form has been considered as one of the practical issues for industrial applications. The purpose of this study is the development of novel naphthopyran derivatives by overcoming this serious issue.

The novel naphthopyran derivative (Compound **1**) developed in this study could suppress the formation of the TT form as shown in Fig. 1a. In comparison with the commercially available NP derivative, **1** shows the efficient coloration and the rapid thermal decoloration reaction with the half-life of 1.8 s (Fig. 1b).

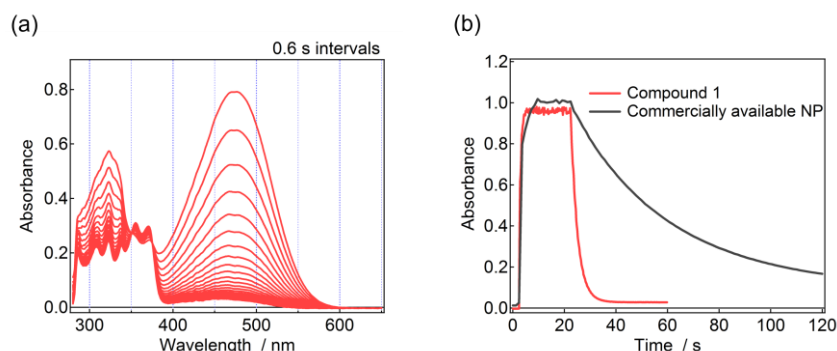


Figure 1. (a) The time evolution of the absorption spectra of **1** in toluene (5.4×10^{-5} M) upon UV light irradiation ($\lambda_{\text{ex.}} = 365$ nm, 440 mW/cm²) at 298 K. (b) The time profiles of the absorbance of **1** in toluene (5.4×10^{-5} M) and that of commercially available NP derivative in toluene (5.5×10^{-5} M), monitored at the wavelength of the maximum absorption.

Reference:

[1] K. Arai, Y. Kobayashi, J. Abe, *Chem. Commun.*, **2015**, 51, 3057