



Optical properties of thiol-containing imide compound via excited state intramolecular proton transfer

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Topic: Functional polymers: synthesis, properties (optoelectronic properties)

Abstract:

Highly fluorescent (FL) polyimides (PIs) have attracted many attentions owing to their tunable optical absorption and multi-color emission, excellent thermal stability, and chemical resistance [1]. We have been focusing on an intriguing phenomenon of the excited-state intramolecular proton transfer (ESIPT), which enables a multi-colored FL emission of imide compounds and PIs from normal (N^*), tautomeric (T^*) and anionic (A^*) forms [2,3]. In this study, a novel ESIPT imide compound containing a thiol ($-SH$) group (1TPM-MC) was synthesized (**Fig. 1(a)**) and its optical properties were analyzed. The excitation and emission spectra of 1TPM-MC, both in solutions and in PMMA-dispersed film, are shown in **Figs. 1(b,c)**. An intense blue FL from N^* was observed at 428 nm in cyclohexane, whereas an orange FL attributable to the proton-transferred T^* due to its large Stokes shift (10553 cm^{-1}) was observed at 599 nm in ethyl acetate. In contrast, 1TPM-MC dispersed in PMMA exhibited FL emitted from both N^* and T^* . These results indicated that 1TPM-MC shows multi-colored FL according to the surrounding environment, which could be attributed to significant changes in the stable structure and electronic state. This study proposes a new molecular design strategy for preparing multi-colored FL imide compound and PIs which are applicable to solar spectral converters.

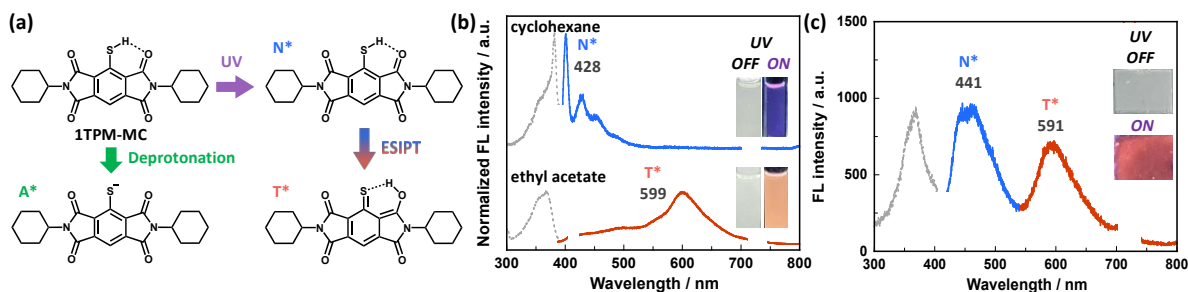


Figure 1. (a) Structural change in N^* , T^* , and A^* forms of 1TPM-MC. Excitation (dotted line) / emission (solid line) spectra in (b) solutions and (c) PMMA-dispersed film.

References:

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3. A. Tabuchi, T. Hayakawa, S. Kuwata, R. Ishige, S. Ando, *Mater. Adv.*, **5**, 5629 (2021).