

Creation of triplet-triplet annihilation upconversion systems based on dipyrldylthiazolothiazole host-guest complexes.

(College of Science and Technology, Nihon University)○Kanei Hirosawa, Kosuke Sugawa, Joe Otsuki

Keywords: Photon upconversion; dipyrldylthiazolothiazole; host-guest complexes; triplet-triplet annihilation

Triplet-triplet annihilation (TTA)-based photon upconversion, which converts low-energy into high-energy light, is particularly useful because even low-density light such as sunlight can be used as a driving source. However, the upconverted emission may be attenuated by incorporating the systems in solid phase because of a decrease in the energy transfers between triplet-excited sensitizer-emitter and triplet-excited emitters. To solve this, in this study, the energy transfer efficiencies between emitters through the formation of host-guest complexes consisting of different emitters were investigated. Dipyrldylthiazolothiazole-based emitter (ExTzBox) and perylene were employed as host and guest emitters, respectively.

The host-guest complexes were confirmed by the shift of specific proton peaks (*e.g.*, H_B, H_β, and H_γ) of ExTzBox to higher magnetic fields due to an increase in the electron density, suggesting that the perylene coordinated to the ExTzBox vacancy (Fig. 1).¹⁾ The upconverted emission using ExTzBox-peryene complexes as an emitter in solid matrices was attenuated, as compared with that using perylene emitter alone system (Fig. 2). And, the upconverted emission was not observed using ExTzBox alone system. These results imply that the TTA efficiency was attenuated by complexing ExTzBox and perylene.

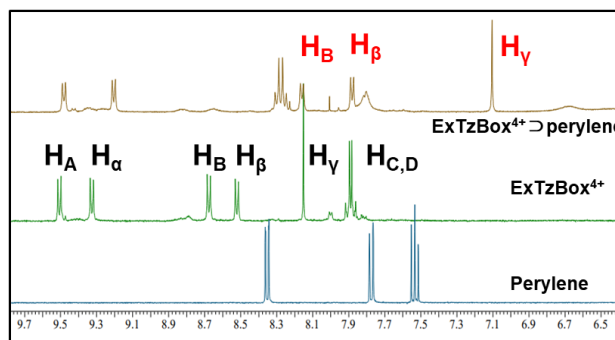


Fig. 1. ¹H NMR Spectra of ExTzBox-peryene complexes, ExTzBox and perylene alone.

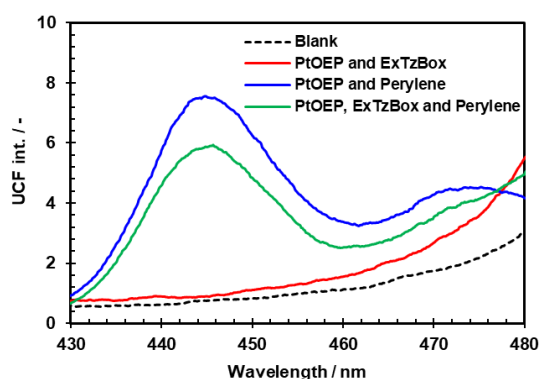


Fig. 2. Upconverted emission spectra using ExTzBox-peryene complexes, ExTzBox and perylene alone.

1) I. Roy et al., *J. Am. Chem. Soc.* **2020**, *142*, 16600.