UV/vis Absorption and Fluorescence Properties of Acylamino-substituted *N*-cyclohexyl-phthalimides

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High thermal stability and excellent mechanical properties of polyimides (PIs) are also beneficial for optical and photonic applications. We have recently established a molecular design strategy for synthesizing highly fluorescent PIs (HFPIs) by use of alicyclic diamines without π-electrons and dianhydrides with extended conjugation [1]. Further, we have reported a novel HFPI containing hydroxyl group in the dianhydride moiety, which effectively extends conjugation [2]. In this study, four kinds of imide compounds (Fig.1) having acylamino groups as electron-donors were synthesized as models for HFPIs, and the effects of intramolecular hydrogen-bonding (IHB) formed between acylamino N–H and imide C=O on their fluorescence properties are examined.

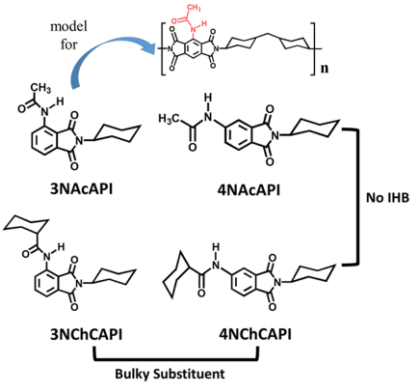

Fig.1. Chemical structures of imide compounds.

The absorption and fluorescence spectra as well as fluorescence quantum yields (*Φ*s) of the compounds dissolved in $CHCl_3$ are shown in Fig. 2. It should be noted that the *Φ*s of the compounds which form IHB (3NAcAPI, 3NChCAPI) are significantly smaller than those of the compounds without IHB (4NAcAPI and 4NChCAPI). This result suggests that there exists a radiationless deactivation process relating to IHB. Moreover, Fig.2 shows that substitution of bulky cyclohexyl group at the acyl position increases their *Φ*s, which implies that such bulky substituent effectively suppresses the radiationless deactivation process in the imide compounds.

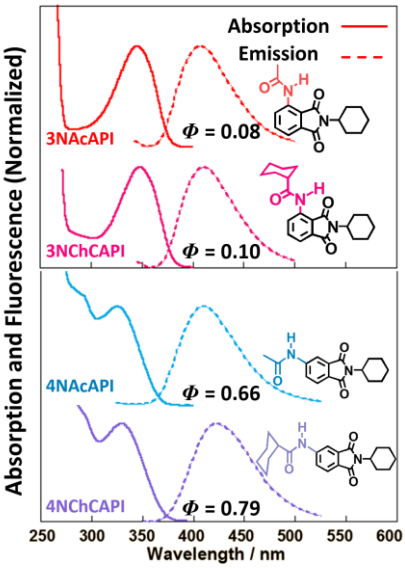

Fig.2. Absorption and fluorescence spectra of imide compounds with *Φ*s.

In consequence, the *Φ*s of acylamino-substituted *N*-cyclohexylphthalimides were reduced by formation of intramolecular hydrogen-bonding, whereas they were increased by substitution of bulky cyclohexyl group at the acyl position.

References

[1] J. Wakita, H. Sekino, K. Sakai, Y. Urano, S. Ando, *J. Phys. Chem. B*, **19**, 15212 (2009).
[2] T. Shimosaka, J. Wakita, S. Ando, *Polym. Prep. Jpn.*, **60**, 1161 (2011).