

Photoluminescence Properties of Novel Fluorescent Polyimide based on Excited State Intramolecular Proton Transfer at the End Groups

Naiqiang Liang

Department of Chemical Science and Engineering, Tokyo Institute of Technology,

E-mail: nliang@polymer.titech.ac.jp

Polyimides (PIs) have attracted broad attention because of their comprehensive performance. Among them, the highly fluorescent PIs have been reported, which had a bright future to be used as wavelength down convertor for solar cells and agricultural applications. However, the Stokes shifts of conventional fluorescent PIs have been still not large enough, and researchers are considering to design excited-state intramolecular proton transfer (ESIPT) PIs. Highly fluorescent PIs based on ODPA/DCHM/3HPA, in which 3HPA is the end-groups having ESIPT ability, exhibited strong green fluorescence emission. Furthermore, it has been reported that introduction of bulky groups to PIs can improve the fluorescent properties because of the suppression of aggregation-induced quenching and intermolecular reaction.

In this report, 6FDA (4,4'-(hexafluoroisopropylidene) diphthalic anhydride) have been adopted instead of ODPA (4,4'-oxydiphthalic anhydride) to prepare 6FDA/DCHM/3HPA ESIPT PIs (Fig. 1). Compared with ODPA, 6FDA has two bulky trifluoromethyl groups, which can enhance the fluorescence properties. The spectra in Fig. 2 indicate that 6FDA type PIs are highly transparent and also exhibit obvious bright green fluorescent at 530 nm when excited at 340 nm, which correspond to the ESIPT photophysical processes occurring at the end group. Moreover, 6FDA-based PIs have obviously higher quantum yields as listed in Table 1, which proves that 6FDA is a good candidate for highly fluorescent copolyimides.

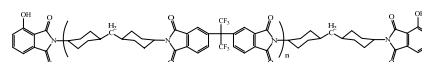


Fig. 1 Structure of 6FDA/DCHM/3HPA PI.

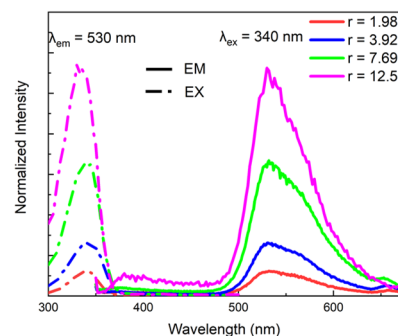


Fig. 2 EX/EM spectra of 6FDA based PIs.

Table 1 End group fraction r , degree of polymerization n , and fluorescent quantum yield Φ of 6FDA based PIs.

r	n	Φ
1.98	100	0.14
3.92	50	0.25
7.69	25	0.22
12.5	15	0.21

Keywords: Fluorescence, Polyimide, ESIPT, Optical transparency