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Synthesis of Luminescent Polyimides Using One-Pot Alternating Polymerization Method

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Luminescent polyimides (**LPIs**) are of interest as an emitting film having mechanical/thermal stability and durability. Such a characteristics of **LPIs** leads them to be applied as an emitting layer for polymer light emitting diodes (**PLEDs**). To date, several **LPIs** having a fluorophore in the main chain have been reported. In general, efficiency of the **PLED** devise using **LPIs** are quite low presumably because of the concentration quenching and the less efficient excimer formation of chromophores in the film state. On the other hand, we have reported the one-pot synthesis of alternating copolyimides (**altPIs**) on the basis of unique reactivity of the spiroalicyclic dianhydride *rel*[1*R*,5*S*,6*R*]-3-oxabicyclo[3.2.1]octane-2,4-dione-6-spiro-3'-(tetrahydrofuran-2',5'-dione). In the present study, we synthesized **altPIs** having fluorescent units in controlled distances in the main chain and evaluated its photoluminescence behavior.

The absorbance and fluorescence spectra of **altPI** having fluorescing 9,10-diphenylanthracene unit and adamantyl spacer are shown in Figure 1. The λ_{\max} value of the fluorescence of the polyimide in the film state was 447 nm. This is in sharp contrast to the reported polyimide having the same chromophore, of which the λ_{\max} in the film state was >500 nm due to the exciplex formation. In our case, although the red-shift of 10 nm was observed compared to the solution state spectrum, such an exciplex formation seems to be effectively suppressed. This might be because the presence of bulky spacer unit along with sterically demanding DAN moieties inhibited the chromophores to become close to each other in the solid state. In addition, we found that the film of random copolyimide, a constitutional isomer, was less fluorescing compared to the alternating counterpart. This emphasizes that the precise control of the molecular structure is important to develop **LPIs**.

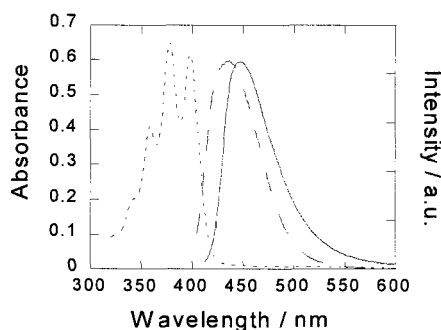


Figure 1. The absorbance (dotted line) and the fluorescence spectra (broken line) of the **altPI** in DMSO, and the fluorescence spectrum of **altPI** film (solid line).

References

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