# Synthesis of Thermal-stable and Photo-crosslinkable Polyfluorenes for the Applications of Polymer Light Emitting Diodes

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## Abstract

The goal of this research is aimed to synthesize thermal-stable and photo-crosslinkable polyfluorenes. Three series of polyfluorenes which have oxetane-containing phenyl group at C-9 position were synthesized via the palladium-catalyzed Suzuki coupling reaction. Among them **PF-B1** and **PPF-B1~B2** emit blue light. **PF-G1** and **PPF-G1~G2** emit green light, while **PPF-R1~R2** emit red light. Different electroluminescent performance was found based on the design of device structures. A double-layer device using PPF-B1 as the active layer showed a threshold voltage of 5V, a maximum brightness of 2289 cd/$m^2$ , and a maximum current efficiency of 1.27 cd/A. Using PPF-G2 as the active layer, the device exhibited a threshold voltage of 6V, a maximum brightness of 5605 cd/$m^2$ , and a maximum current efficiency of 5.69 cd/A. Using PPF-R1 as the active layer, the device showed a threshold voltage of 4V, a maximum brightness of 2135 cd/$m^2$ , and a maximum current efficiency of 0.16 cd/A. Besides, the phenomena of the keto defect and aggregation are usually seen for the blue emissive polyfluorenes. The polymers synthesized in this work show good ability against the formation of keto defect, reduced aggregation of polymer chains during annealing, and enhanced stability against thermal-oxidation.

Due to the photo-crosslinking property of oxetane groups, the UV-exposed thin film are not soluble in common organic solvents. A device containing blue, green, and red-emissive pixels is easy to fabricate by spin-coating and photolithography processes. In addition, a white

light-emitting device was made with CIE coordinate of (0.335, 0.329), by blending PPF-R1 with host materials PPF-B2 as the active layer.