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In the past few years polymer-based organic light-emitting diodes (OLEDs) have acquired much interests, and great efforts have been devoted to the design and synthesis of light-emitting polymers for practical applications.<sup>1,2</sup> There are a few suitable polymers for fabricating prototypes of OLEDs which emit green, orange, or red color.<sup>3</sup> A lot of attention has been paid to poly(9,9'-dialkylfluorene)s (PFs) as a prospective blue emitting layer for OLEDs. PFs display extremely high photoluminescence (PL) efficiencies both in solution and in solid films, with emission wavelengths primarily in the blue spectral region. Photo-stability and thermal stability of PFs are also found to be better than those of the poly-phenylenevinylenes (PPVs). PFs contain a rigid biphenyl unit, which leads to a large band gap with efficient blue emission, and the remote C-9 position, which allow facile substitution, to improve the solubility, without significantly increasing the steric interaction with the polymer backbone.

One of the problem of using polyfluorenes (PFs), the most promising polymers for blue OLEDs, is their tendency to form aggregates/excimers, turning the desired blue emission colour into the undesired blue-green emission and a drop of electroluminescence (EL) quantum efficiency. Here we report the synthesis and properties of new EL polymer, poly(2,6-(4,4-bis(2-ethylhexyl)-4H-cyclopenta[def]phenanthrene))(PCPP), with stabilized blue emission. PCPP contains new back-bone structure and anthracene end capping group. The EL spectrum of the ITO/PEDOT/PCPP/Al device exhibits maximum peaks at 400 nm. The voltage-current density characteristics of the devices fabricated from PCPP revealed that the turn-on voltage is approximately 6.0 V. The maximum brightness of PCPP is 1500 cd/m<sup>2</sup> at 14 V. The maximum luminescence efficiencies of the polymer LEDs with PCPP at room temperature were 0.70 cd/A at 180 mA/cm<sup>2</sup>. The 1931 Commission Internationale de L'Eclairage CIE coordinates of the EL spectra of PCPP were  $x = 0.17$ ,  $y = 0.12$  without any filtering.

In case of known PF2/6, the PL intensities of the low-energy emission band in the region of 500-600 nm were increasing dramatically after annealing for up to 18 hours at 150°C in air, consistent with the previously reported results with PFs. However, the PL spectra of PCPP did not show any peak in the long wavelength region which corresponds to aggregates/excimers even after annealing for 18 hours at 150°C in air. The EL spectra of OLED fabricated from PCPP and PF2/6 in the ITO/PEDOT:PSS/polymer/Al configuration were obtained after annealing the device for up to 18 hours at 150°C in air. In the EL spectra of the OLED from PF2/6, the low-energy emission band in the region of 500-600 nm was prevailing after annealing. In contrast, the EL spectra of the OLED from PCPP was not changing without showing any peak in the region of 500-600 nm even after annealing for 18 hours at 150 °C in air. After

operation of the device up to 40 minutes, the EL spectra of the OLED from PF2/6, the low-energy emission band was increasing dramatically. On the contrary, the initial EL spectrum of the OLED from PCPP was cleanly preserved without showing any peak in the region of 500-600 nm even after operation of the device for 40 minutes in air.

## References

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