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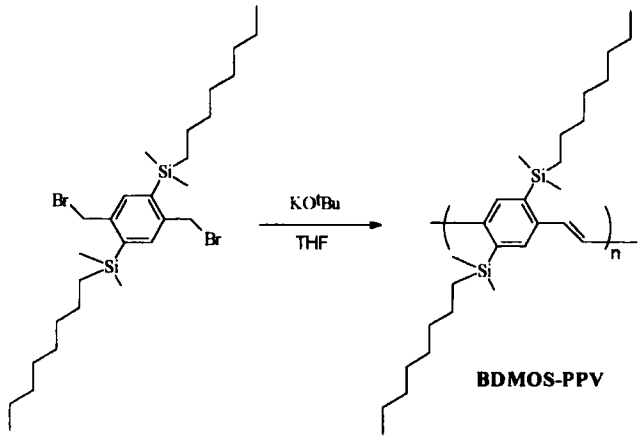
Abstract. Light-emitting properties of a solvent processable poly(1,4-phenylenevinylene) (PPV) derivative, poly[2-bis(dimethyloctylsilyl)-1,4-phenylenevinylene] (BDMOS-PPV) have been studied. Synthesized BDMOS-PPV is highly fluorescent and the measured absolute PL quantum efficiency is exceeding 60 %. Single layer electroluminescent device (ITO/BDMOS-PPV/Al) exhibits an emission maximum at 515 nm which corresponds to the green region.

Keywords: soluble PPV derivative; electroluminescent device

INTRODUCTION

Electroluminescent (EL) devices based on organic materials have attracted much attention in the past ten years due to their potential applicability in display technology.[1] Polymer light-emitting diodes (LEDs) have many advantages for the development of a large-area visible light-emitting display, such as good processibility, low operation voltage, fast response time and

color tunability over the full visible range by control of the HOMO-LUMO bandgap of the emissive layer.[2] PPV has been most widely used as the emissive layer for the light-emitting diodes. Recently we have synthesized a solvent processible PPV derivative, poly[2,5-bis(dimethyloctylsilyl)-1,4-phenylenevinylene] (BDMOS-PPV). In this report, characteristics of the EL devices using BDMOS-PPV is discussed.



BDMOS-PPV

EXPERIMENTAL

UV-VIS spectra were obtained with a Hitachi U-3501 spectrophotometer. Photoluminescence spectra were obtained by exciting the polymer film with the light of 450 nm from Zenon lamp. EL spectra were measured using a monochromator (Jobin Yvon HR320) with the photomultiplier tube (Hammamatsu R928). Current-voltage (I-V) and light intensity-current (L-I) characteristics were measured using the current/voltage source (Keithley 238A) and the calibrated silicon photodetector (Newport 818SL). The emitted light was collected with the photodetector placed in front of the device and some portion of the emitted light is lost. All the measurements were performed in air at room temperature.

RESULTS AND DISCUSSION

Synthesized BDMOS-PPV is soluble in common organic solvents such as chloroform, tetrahydrofuran and xylene without evidence of gel formation. GPC measurement of this polymer with polystyrene as the calibration standard shows a M_w of 46,500 and polydispersity index of 3.1.

The absorption maximum and edge of the BDMOS-PPV film are at 436 and 520 nm, respectively. BDMOS-PPV shows a PL emission maximum at 515 nm which corresponds to the green region. The absolute photoluminescence quantum efficiency for a solid film of BDMOS-PPV is measured to be greater than 60 %. In comparison, the reported PL efficiencies of PPV and MEH-PPV are 27 and 15 %, respectively.[3] Single layer EL devices have been fabricated using BDMOS-PPV as the emissive layer, and ITO and aluminum as anode and cathode, respectively. Figure 1 shows PL and EL spectra of the BDMOS-PPV film.

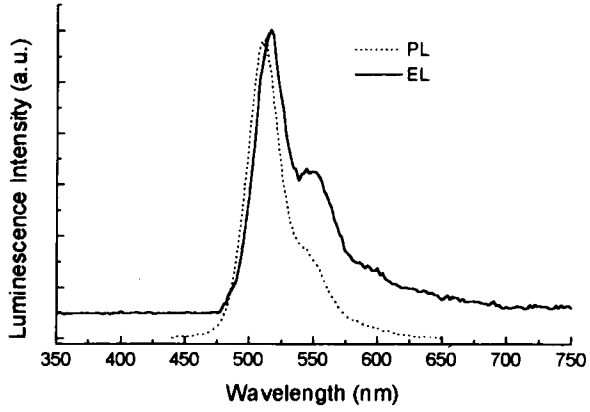


FIGURE 1. PL (dot) of BDMOS-PPV film and EL (solid) of the ITO/BDMOS-PPV/Al device.

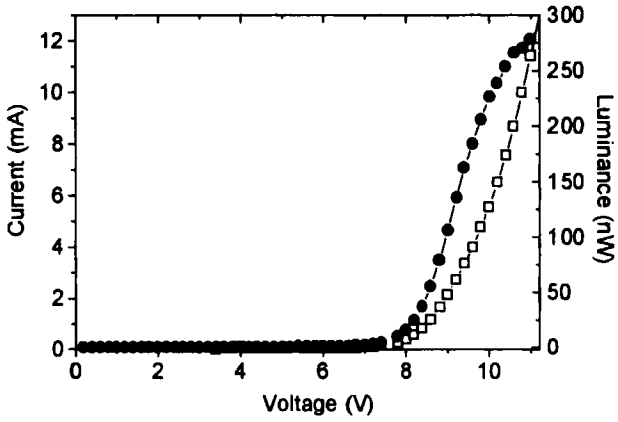


FIGURE 2. I-V (open square) and L-V (filled circle) curves of the ITO/BDMOS-PPV/Al device

Figure 2 shows the current voltage characteristics measured for a typical ITO/BDMOS-PPV/Al device. The forward current increases with increasing forward bias and the curve shows typical diode characteristics. Voltage dependence of the emission intensity from the device shows that light emission becomes visible at bias of about 8 V.

The BDMOS-PPV film has good processability and the high quantum efficiency may make it a good candidate for application in polymer LEDs.

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