Oriented Thin Films Composed of Polyfluorene and Oligothiophene for Polarized White Light Emitting Devices

Nobutaka Tanigaki*, Claire Heck, and Toshiko Mizokuro
Research Institute for Ubiquitous Energy Devices, National Institute of Advanced Industrial Science and Technology (AIST), Ikeda, Osaka 563-8577, JAPAN
E-mail: no.tanigaki@aist.go.jp

We have been studying the production of oriented films of various conjugated polymers by means of the friction transfer technique. The method has been applied to produce oriented poly(9,9-dioctylfluorene) (PFO) films which were then used to produce devices that emit polarized blue light [1]. In this work, we fabricated the oriented films composed of PFO and sexithiophene (6T), which is an orange emitting dye, for production of white polarized light emitting devices.

We fabricated oriented films of PFO and 6T by two methods, aiming to produce devices that emit white light. One is 6T-doping into oriented PFO films by means of vapor transportation methods [2] where the doping process is performed after film production without loosing molecule orientation [3]. This method allows doping of 6T into the oriented PFO films in such a way that the dye orientation is parallel to that of the orientation of the PFO film, leading to the emission of white polarized light [4]. Polarized electroluminescent (EL) spectra are shown in Figure 1.

![Figure 1. Polarized EL spectra of the device based on 6T-doped PFO](image_url)

6T Doped PFO Parallel to friction direction
6T Doped PFO Orthogonal to friction direction
In another method we produce thin 6T films, by means of vacuum deposition, directly on top of the oriented PFO films, before device production. We try to further understand the mechanism of these devices, which emit white polarized light, by studying the effect of the dye at the interface or emitting region. We then analyze, among other factors, the influence of 6T film thickness on the color changes and on the luminance and the efficiency of the devices. Results show (see Figure 2) that whitening of the EL device is possible with good polarization of the emitted light. It was also observed that the color change is linearly dependent on 6T film thickness and that the efficiency decreases with increase of 6T thickness.

Figure 2. CIE chromaticity diagram of EL devices based on 6T - oriented PFO films. Whitening is observed to increases with the thickness of 6T films.

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References