Synthesis and Characterization of Soluble Polarized Phosphorescent Copolymer Having an Iridium (III) Complex Moiety

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In general, OLEDs emit isotropic light. However, isotropic luminescence reduces the efficiency of the OLED as it passes through the polarizer. If the liquid crystalline (LC) material induces anisotropy in the light emitting layer (EML) in the device, polarization light may be generated and the light efficiency can be improved when passing through the polarizer. Recently, mesogenic light emitting materials with phosphorescent chromophores are expected to emit polarized light with high quantum efficiency. In this study, fluorene units with iridium complex structural moieties suitable for phosphorescence emission were introduced into the polymer's backbone to synthesize the liquid crystalline copolymers capable of phosphorescence emission. Homo- and copolymers were prepared by varying the feed ratios of three monomers by polycondensation using the Suzuki coupling reaction as shown in Fig. 1, and their properties were characterized. The molecular weight information of the copolymers was investigated by gel permeation chromatography (GPC). The number ($M_n$) and weight average molecular weights ($M_w$) of copolymers were determined to be 6700 and 7900, respectively. The polydispersity index (PDI) of copolymers was about 1.19. The structure and composition of the homo- and copolymers were confirmed by $^1$H-NMR and FT/IR spectrometry. Absorption and emission characteristics were investigated by UV-vis and PL spectrometry. The use of phosphorescent chromophores was expected to emit red light. However, we found that blue light was emitted depending on the content of iridium. In addition, the higher the content of iridium, the lower the solubility and it is difficult to identify the liquid crystal phase. Nevertheless, some of the synthesized copolymers can represent a lyotropic liquid crystalline phase.

Fig. 1. Structure of soluble polarized phosphorescent copolymers.

![Fig. 1. Structure of soluble polarized phosphorescent copolymers.](image)

Fig. 2. UV-vis and PL spectra of copolymers.

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References