Study of a Polarization Ratio Property of a Conjugated Liquid Crystalline Polymer Depending on a Surface Anchoring Energy

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Organic light emitting diodes (OLED) have been studied for a display applications because of their excellent characteristics such as low voltage driving, high brightness, and good color performance [1]. In particular, polymer light emitting diode (PLED) has attracted in low-cost fabrication process based on solution process. In PLED, the direction of the emitted light, i.e. polarization state, is affected by an azimuthal direction of the conjugated polymers. To obtain a polarized light from OLEDs, various aligning methods were studied such as direct rubbing, stretching, friction, Langmuir-Blodgett deposition, and the use of nanostructures [2-6].

In this paper, we investigated a polarization ratio property of a conjugated liquid crystalline polymer depending on a surface anchoring energy. Poly(9,9- dioctylfluorene-co-benzothiadiazole) (F8BT from American Dye Source) with a nematic LC phase was used as an emitting layer for polarized OLED. To controlling the azimuthal ordering of the emitting polymer, a planar alignment layer was spin-coated on to an indium-tin oxide (ITO) as an anode, and then, the vertical alignment layer was stacked with same method. The thickness of the vertical alignment layer was controlled by the dilution ratio. As increase a thickness of the vertical alignment layer, the azimuthal anchoring energy decreases because the vertical alignment layer screen the energy from the planar alignment layer to emitting layer. The F8BT layer dissolved in toluene was spin-coated on the vertical alignment layer. We measured a retardation value of the emitting layer as a function of the thickness of the vertical alignment layer. The retardation was decreased as increase the thickness of the vertical alignment layer. Since the thickness of the F8BT layer was same to 60 nm, the small retardation value means that the conjugated polymer has low order parameter due to low azimuthal anchoring energy. The polarization ratio was measured using photoluminescence. As expected, the polarization ratio increases as increasing the azimuthal anchoring energy.

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