Time-Dependent Degradation of Circular Polarization Ratio in Chiral Mesogenic Luminophore

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Emission of circularly polarized (CP) light has attracted great attention for improving device performance. The degree of CP emission is defined by the dissymmetric factor, $g = 2(I_L - I_R)/(I_L + I_R)$, where I_L and I_R denote the intensities of left-handed and right-handed CP light, respectively. Especially, high degree of CP emission was achieved in a helical configuration of mesogenic luminophore by doping a chiral agent [1] or by rubbing two different surfaces [2]. In this work, we investigate the dissymmetric factor of the intrinsic chiral luminophore as a function of elapsed time after sample fabrication. The fluorene moiety containing chirality was used for an emitting layer (EML) and annealed thermally above its mesogenic temperature after coating on the rubbed alignment layer. The EML constructed the twisted structure without any treatment after cooling down at room temperature. The twisted EML generates the CP light, whose dissymmetric factor is governed by helical twisting power (HTP) and thickness of the EML. Interestingly, the dissymmetric factor (g_{PL}) of the photoluminescence (PL) was gradually degraded according to time elapsed after sample preparation as shown in Figure 1. These degradation behaviors were observed in both rapidly and slowly cooling processes. Such phenomenon is expected to be originated from weaker HTP of the intrinsic chirality than the specific chiral dopant such as S(R)05011 [1]. Restoring process of the dissymmetric factor was also investigated.

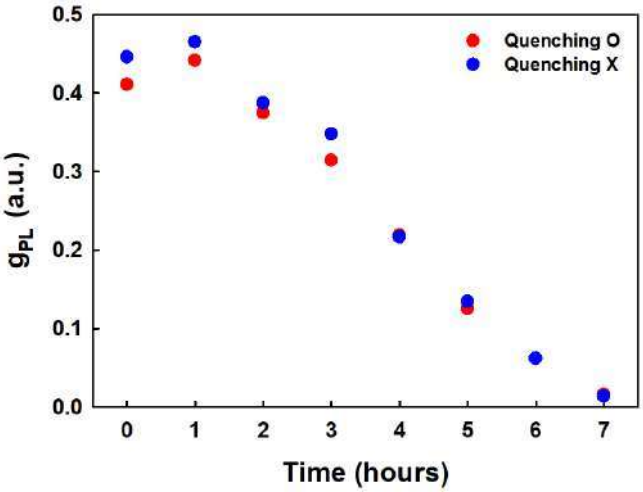

Fig. 1. The dissymmetric factor of the PL process according to elapsed time after sample preparation.

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References

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