Smart Reflector using Photo-luminescence Cholesteric Liquid Crystal Film

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Cholesteric liquid crystals (CLCs) with spontaneous herical structure is facily achieved by chiral dopants into nematic liquid crystals, and it exhibits structural color reflection due to bragg reflection in visible range. CLCs with photo-reactive fucntional group, which is called cholesteric reactive mesogen (CRM), can be polymerized via ultraviolet (UV) irradiation, and one can fabiricate a solidified film with the structural color reflection. The film made of CRM can be used for a color reflector in reflective type displays. In this work we fabricated reflection-emission reflector by adding photo-luminescence (PL) into CRM, and we investigated the reflection color in terms of color purity. The addition of PL into CRM significantly improved the color purity in the color reflection.

A Green PL-CLC mixture with peak wavelength 550nm was prepared by mixing 29wt% of Cholesteric RM (RMS09-069, Merck), 71wt% of nematic RM(RMS04-083C, Merk) and 0.4wt% PL, Coumarin 6(C6). The PL molecules uniformly diffused in CLC using sonication. Fig.1(A) shows the reflectance of the cells injected by CLC and PL-CLC. The reflectance within the photonic band was almost twice increaed, but the reflectance in the range of higher wavelengths than the photonic band decreased as indicated in Fig. 1(A). The decrease of reflectance in high wavelengths results from the light-absorption by C6, which has absorption band in the range of 400 to 490nm. The absorbed blue light was re-emitted as green light, which brings about the increase in the reflectance in green light. Becase of the light absorption in blue wavelength, the color purity dramatically improved. Fig. 1(B) shows the luminacence spectrum under UV back-light illumination, which shows a increase of luminacence spectrum by adding BBOT, a short wavelength PL dopant. BBOT absorbs the UV light and transfers the absorbed energy to C6, and so the the green light emission is much improved.

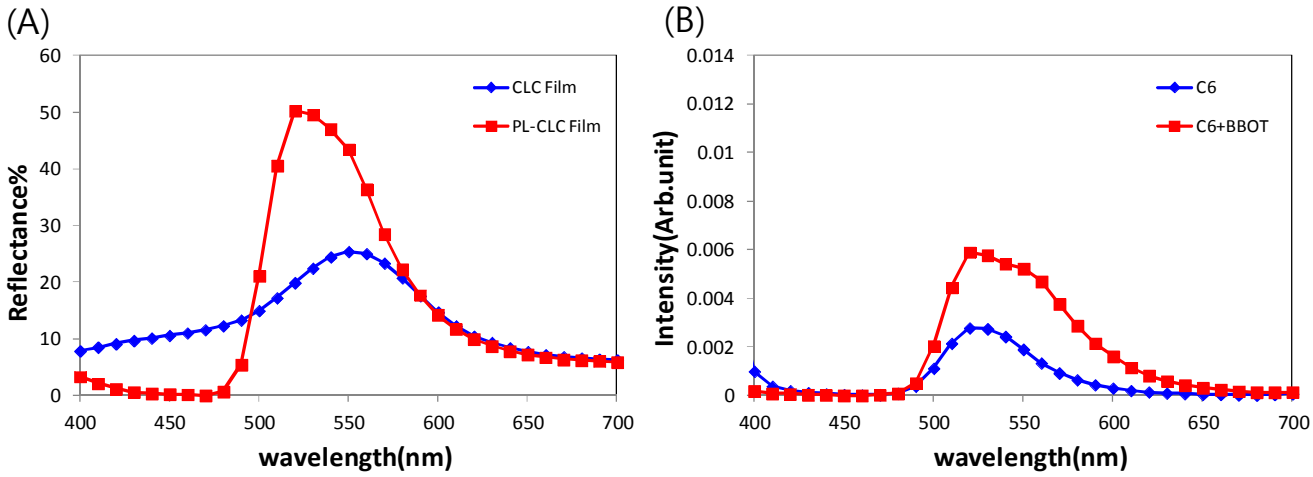

Fig. 1. (A) reflectance of CLC and PL-CLC and (B) Photo-luminescence intensity of C6 and C6 + BBOT

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References

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