

# Electro-Optical Properties of Dye-Doped Normally Transparent Polymer Network Liquid Crystals

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Recently, transmittance variable devices, particularly with normally transparent and black background properties, for transparent displays have been paid much attention. Polymer dispersed or network liquid crystal (PDLC or PNLC) was thought to be a candidate for them. Dye-doped PDLCs for black background have been much investigated [1-2], but they showed normally dark state. Normally Transparent PDLCs were also investigated by several groups [3-4], but they showed white background. We developed a normally transparent PNLC with black background. It was made by polymer network formation of the cell with liquid crystal-reactive mesogen (RM)-dichroic dye mixture. The liquid crystal molecules were vertically aligned at voltage-off state and randomly oriented after applying voltage. The polymer network formed by RM contributed to the random orientation. The electro-optical properties of the liquid crystal device dependent on RM and dye composition were investigated.

A negative LC (RTA-93000-100), RM and black dye corresponding to it were used in our experiment. PNLC cells were fabricated with the change of key parameters: UV exposure time of 1, 5, 10min for the UV intensity of  $20\text{mW}/\text{cm}^2$  and LC-RM concentration ratio of 96:4, 92:8, 88:12 and 84:16, dye concentration of 0.5, 1.0 and 1.5wt% with respect to the LC-RM mixture. Fig.1 shows the voltage-transmittance characteristics of the PNLC cells with variation of dye concentration in case of RM concentration of 12wt%, UV intensity and exposure time of  $20\text{mW}/\text{cm}^2$  and 1min. Fig.2 shows the image of the cell fabricated at the following condition: the concentration ratio of LC:RM:dye=86.5:12:1.5, UV intensity and exposure time of  $20\text{mW}/\text{cm}^2$  and 1min.

The parameter dependent electro-optical properties of the black NT-PNLCs will be discussed in the presentation.

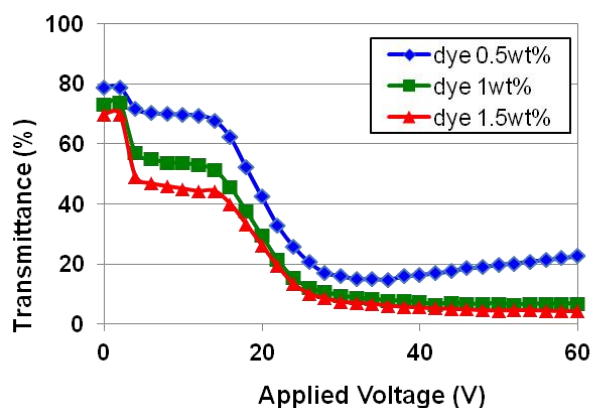


Fig.1 E-O properties of PNLCs with variation of dye concentrations

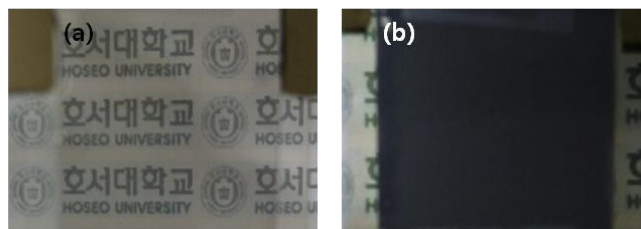


Fig.2 PNLC cell images (a) Off-state( $V_a=0\text{V}$ ) and (b) On-state( $V_a=60\text{V}$ )

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