Nano-Encapsulated Liquid Crystal Display Mode with Reduced Driving Voltage

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The flexible liquid crystal display (LCD) technologies have attracted great interest due to their well-established manufacturing processes and excellent display performance. However, the mechanical stability of the LCD and the uniform cell gap between two plastic substrates are critical factors to apply the flexible displays. To improve the mechanical stability of the flexible LCDs, several techniques such as polymer dispersed liquid crystal (PDLC) [1], polymer-network liquid crystal (PNLC) [2], and pixel-isolated liquid crystal (PILC) [3] have been reported. However, two substrates were required during the fabrication process even though one substrate would be finally removed after the fabrication. Recently, the nano-encapsulated LCD with a fast response time, prepared by the coacervation method [4], was proposed for the flexible display applications [5] but the high operating voltage was required.

In this work, we suggested the nano-encapsulated LCD with reduced driving voltage by introducing the bipolar in-plane switching (IPS) scheme. At first, we prepared LC capsules with 200 nm in diameter used by the coacervation method. The small LC capsules shows the fast response due to the short correlation length by shell of the capsule. To reduce the operating voltage, we introduced the bipolar IPS electrodes. As a result, the operating voltage was remarkably reduced.

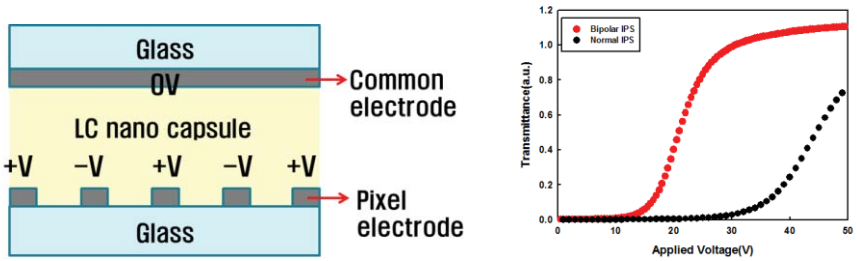

Fig. 1. (a) The schematic diagram of bipolar IPS mode. (b) Transmittance of the nano-encapsulated LC mode under the normal IPS electrode and the bipolar IPS electrode.

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