Light Leakage Simulation of the Curved ADS LCD

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In previous paper [1], a curved ADS LCD panel was thought of as 3 optical uniaxial layer; an LC layer and two uniaxial layers which have a several optical retardation magnitude and not uniformed axis distribution on panel. In the external bending force apply to LCD panel. The optic axis of the glass deviated from the horizontal direction to oblique direction due to surrounding sealant bonding, so initial light polarization easily leaked at the 4edges location of panel between crossed polarizers. Different bending depth (curvature radius) and glass thickness were known as major factor to determine the light leakage by the the Ansys structure simulation and Jones’s optic calculation processing [1].

Here, we investigated another the way how to reduce the light leakage by changing physical properties of the H & V panel widths, and H &V sealant's parameter through simulation processing, using the 27inch MNT panel size, 0.4mm glass thickness and normal ADS LC mode. Figure 1 shows the H :V width ratio splits (case #1; 4 : 3, 16:9, 25:9) transmittance map. From this results, the larger is asymmetrical structure of the H: V width, the less light leakage exists. For case #2, H & V sealant's elastic constant was changed with reference 1.6Gpa and, case #3, only the H sealant's elastic constant was changed (V’s value was fixed), case#4, only V sealant's elastic constant was changed(H’s value was fixed). From these results, the more soft is elastic properties of the horizontal sealant, the less light leakage exist.

For case #1, #2, #3, magnitude and axis changing are similar contribute to changing of the transmittance. But, for case #4, light leakage and retardation are hardly improved.

Simulation data of the optical retardation magnitude and axis was noticed in the Fig. 3, the magnitude is very similar to calculating value by the the stress optic law of glass(stress_optic_constant *young module* t²/2R). From this results, the geometric width of H&V ratio and the elastic properties of the horizontal side sealant are major contribution to location and strength of light leakage in the curveved ADS panel.

References