High Speed In-Plane Switching Liquid Crystal Cell By Using Photo Alignment Method

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Liquid crystal displays (LCDs) have been widely used in various applications such as mobile phones, tablet personal computers (PCs), monitors, and televisions (TVs), because of its superior electro-optical performances including high transmittance, high resolution and wide viewing angle characteristics. In-plane switching (IPS) mode [1], which is representative LCD mode, exhibits wide viewing angle properties because LC molecules are homogeneously aligned in the mode. In spite of its superior performance, the IPS mode does not show sufficient high-speed response time for moving pictures. In particular, current LCD devices are recently being required for application to the 3D moving pictures which need fast-response LCDs to minimize the cross-talk. Therefore, development for high speed LCDs are very important. Several methods for improving the response time have been proposed. In our previous study, we reported the retardation free (RF) IPS LC cell with low cell gap for high speed response time by using a retardation film [2]. This cell is not affected by the retardation of the LC cell if it has more than quarter wave retardation. Therefore, the cell gap which is cell parameter for improving the response time can be reduced without any changes in the LC materials so that the response time also could be reduced. Recently, *kim et al.* proposed the method about the enhancement of the surface anchoring energy using photo-alignment (PA) method for improving the response time [3]. In general, the PA method has insufficient alignment stability and relatively weak surface anchoring energy. However, they introduced the PA layer coated with UV curable reactive mesogen (RM) and mixed with RM for enhancing the stability of PA layers. Thus, the fast response time in an IPS mode can occur. In this paper, we propose the high speed RF IPS cell with strong anchoring energy using the PA layer. The structure consists of an *A*-plate and an LC layer in Fig. 1. For strong anchoring energy of PA layer, we stacked the RM layer on the PA layer in RF IPS mode. The alignment direction of the LC directors is established by linearly polarized UV exposure. As a result, we could realize the high speed response time by reducing the falling time over 40% compared with the conventional IPS LC cell without a loss of the transmittance.

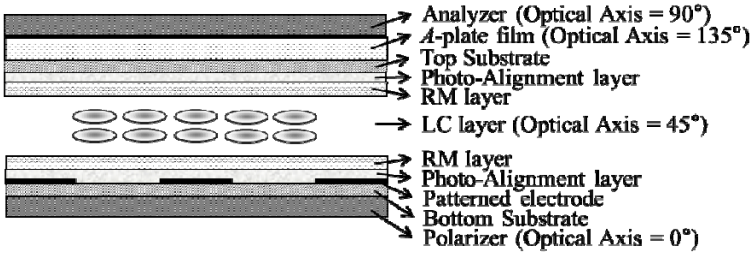

Figure 1. Optical configuration of the proposed RF IPS LC cell with Photo alignment layer.

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