Brightness Enhanced Novel Parallax Barrier Type 3D Displays

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Parallax barrier type 3D technology[1] has been applied to various glasses-free 3D displays for mobile[2], notebook and monitor devices. It has many advantages such as easy design, fabrication and 2D-3D conversions in comparison with lenticular lens type one. However, it has an intrinsic serious disadvantage, 'low brightness'.

We developed a brightness enhancement technology for the parallax type 3D displays. New parallax barrier consists of reflective polarizer and patterned active retarder. Basic operation principle of it is to recycle the light, which is absorbed at barrier in normal parallax barrier 3D. The concept is depicted in Fig.1 (b). The light coming to slit area has the polarization parallel to the transmission axis of reflective polarizer, so that passes through the parallax barrier layer onto the TFT-LCD. On the other hand, the light coming to barrier area has the polarization perpendicular to the transmission axis of reflective polarizer, so that reflects from the parallax barrier layer, and come to the BLU, and reflect from BLU. If it meets the slit area on the way of recycling then it passes through the parallax barrier layer onto the TFT-LCD. If it meets the barrier area then it reflects again. If there is no loss of light on the way of propagating the optical components of reflective polarizer, active retarder and BLU, then all lights emitting from BLU go to TFT-LCD through the slit area. But, there is some loss in the reflecting polarizer, active retarder and BLU. The higher the polarization degree is, the less the loss of light is.

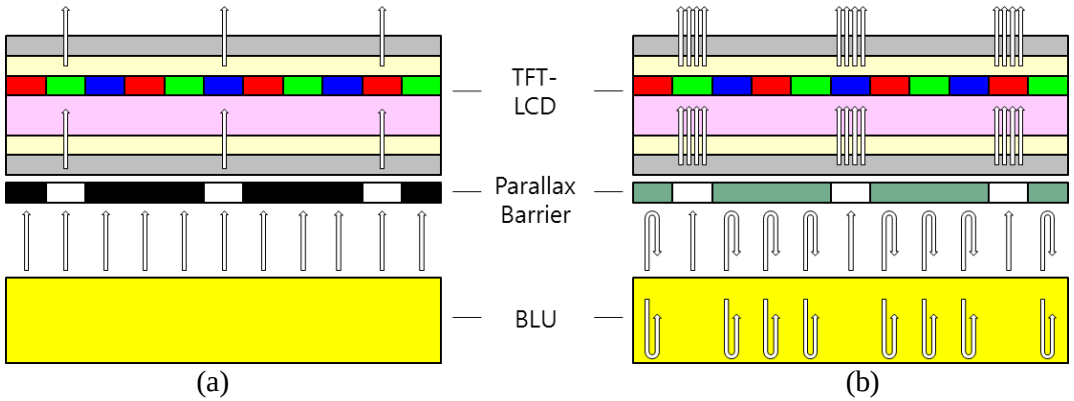

Fig. 1. Parallax barrier type 3D display configurations: (a) conventional display (b) new display

We made an eight-view 3D display using the light-recycling technology using commercially available reflective polarizer (DBEF, 3M) with polarization degree of 0.9. The light efficiency of it exceeded two times that of conventional one. The details of theoretical principle and light efficiency measurement results related to the optical properties of the optical components used in experiment will be discussed in presentation.

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