應用微型透鏡陣列結構以增加
透反式液晶顯示器之光效率

研究生： 王俊傑　　指導教授：謝漢萍 教授

國立交通大學光電工程研究所

摘要

隨著多媒體應用及網際網路的普及，透反式液晶顯示器憑藉其體積小、重量輕及耗電量低，目前已經被廣泛地應用於多種可攜式產品上。然而，其較低的背光利用率仍是一個極需解決的問題。當透反式液晶顯示器使用背光系統當光源時，部分的背光會被反射區阻擋，進而造成光利用率的降低。為了解決此問題，本篇論文提出一種具微型透鏡陣列之新型透反式液晶顯示器，以增加背光利用率且同時維持反射模式下的光利用率。另外，為了減少在製造過程所產生的對位誤差，本論文也提出自我對位曝光技術 (Self-aligned exposure)，來降低對位誤差並同時製造所需的微型透鏡陣列結構。藉此技術，我們製作出一個曲率半徑為 66 微米、直徑為 68 微米以及反射區開孔為 27 微米之微型透鏡陣列結構。最後，使用 ORMON 背光模組當作光源可以得到 1.4 倍的光增益效果，這樣的結果展現出微型透鏡陣列結構的確可以有效的收集背光並提升背光使用率。

Micro-lens Array on Transflective LCD for Light Efficiency Enhancement

Student : Jun-Jay Wang Advisor : Dr. Han-Ping D. Shieh

Department of Photonics and Institute of Electro-optical Engineering

Abstract

As the population of multimedia and internet applications, the market of transflective liquid crystal display (LCD) for portable products is increasing due to their remarkable merits of thin, light and low power consumption. However, lower backlight efficiency is a critical issue. When the backlight is used as light source, reflective regions will block some incident backlight, thus reducing backlight utilization efficiency. Hence, a novel transflective LCD consisting of a lenticular-lens array was proposed to increase backlight efficiency while maintaining reflective light efficiency. In addition, self-aligned exposure method was performed to minimize the alignment error and fabricate the lenticular-lens array simultaneously. A lenticular-lens structure with radius of 66um, diameter of 68um and aperture size of 27um of reflective regions was characterized and then 1.4 of gain factor was obtained by utilizing OMRON backlight as light source. It can be concluded that the lenticular-lens array can collect backlight and enhance the backlight efficiency.