Polymer-Stabilized Blue Phase Liquid Crystal Displays Applying Novel Groove Cell Structure

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Abstract

Blue phase liquid crystal displays (BPLCDs) have attracted considerable attention in recent years because of its many advantages. However, BPLCDs exhibit narrow temperature range, high driving voltage, and tough process.

In our works, polymer-stabilized technology using newly optimized BPLC material was applied to enlarge BP temperature range. In order to overcome high driving voltage, 2D1G design was used to apply conventional source driver IC for cost. Furthermore, novel groove cell structure which could gain more effective electric field without adding special masks for the groove was successfully implemented. Finally, 10-inch BPLCDs was demonstrated by optimization of ODF process.

Introduction:

The history of BP is from 1888. Reinitzer, who discovered liquid crystals, described the appearance of blue phases and the fundamental behavior of blue phase was well studied in 1970s. The BP generally is consisted of chiral dopant and host liquid crystal. However, BP appears in narrow temperature range of 1°C and hindered its further application and development [1]. The issue of narrow temperature range has been overcome by using the polymeric stabilization [2], nanoparticles [3] and T-shaped compound [4]. Therefore, various innovational applications were proposed [5] and blue phase liquid crystal display (BPLCD) is one of the most practical applications [6].

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