

Liquid Crystal Device Technologies for High Quality Display

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In this presentation, several major technologies in terms of high quality liquid crystal display for past 20 years will be introduced [1-4]. First of all, I will introduce an excellent LC modelling method which is “Q-tensor method” [5, 6]. The Q-tensor method has been started with Dr. Bos in LCI, Kent state university. The Q-tensor method can model not only the LC director orientation but also local order parameter, which means that defects and phase transition in local LC profiles can be modeled. With this technology, I involved to development of tensor LC modelling tool with Sanayi system Co., Ltd in Korea and also devoted to development and optimization of novel LC cell structure of LC display and Samsung companies through many projects. Then, another study on optical design for high electro-optical characteristics will be introduced [7-10]. In order to make wide-view, high contrast and high speed AMLCD, many excellent optical configurations by using optical films and improved cell structure have been proposed and applied. And, most of the proposed optical cell structures for the advanced AMLCD have been performed with practical viewpoint. In this presentation, I will also show optical technologies for 3D display and multidimensional calculation for ray tracing [11-13]. For switchable 2D/3D display, key technologies can be summarized with LCD structure and optimization and vari-focal LC lens. Therefore, several optical structures of IPS and VA LC cell with wide viewing angle for stereoscopic 2D/3D switchable LCD will be introduced [11]. And I will also show a planar polymeric liquid crystal (PPLC) lens with a low cell-gap (~4.6 μm) for a 2D/3D switchable auto-stereoscopic display [12]. Low cell-gap of the cell is so important because of fast response time, low operating voltage and process reliability. Recently, I reported a multidimensional simulation method for ray tracing in the inhomogeneous aligned LC profile [13]. Therefore, ray path in LC director directors locally twisted to any direction can be exactly calculated. Liquid crystal device technologies for high quality display

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