Enhanced Bistability by Reactive Mesogen in Bistable Chiral Splay Nematic Liquid Crystal Device

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In the present age of the rapid spread of digital information, public concern in the individual mobile display has remarkably being risen. Among the various display technologies for mobile applications, the bistable chiral splay nematic liquid crystal (BCSN-LC) device comes into the spotlight due to its functionality as a dual mode liquid crystal display (LCD) —i.e., the dynamic and memory modes [1]. The BCSN-LC can be switchable between dynamic mode, an optically compensated bend (OCB) mode with fast response characteristic, and the memory mode, a π-twist nematic mode with a long retention time. Between these two LC modes, the memory mode has considerable significance because it is responsible for displaying the texture or still images with low power consumption, which is expected to fully agree with the requirements of mobile display devices. However, the memory retention time determined by the stability of the π twist LC alignment has been limited despite the utmost efforts which have been exerted to extend it [2]. It was difficult that the permanent memory retention time could be achieved in the BCSN-LC device. Recently, the memory characteristic improved by the surface treatment using a reactive mesogen (RM) was presented in our previous work [4]. After UV irradiation, the azimuthal surface anchoring energy enhanced by polymerized RM structure on alignment layers acts as leading powers that disrupts the return to the initial splay state by increase the energy barrier between bistable states. Eventually, we could obtain the improved memory retention time in a BCSN-LC device.

In this work, we investigate the related effect between the memory retention time and the azimuthal anchoring energy enhanced by RM structure. As shown in Fig.1, the memory retention time can be designated by RM concentration associated with the azimuthal anchoring force. This study for the relationship between the memory characteristic and RM structure is directly related to the bistability of the device depending on the fabrication condition. We also discuss an optimized process condition for a BCSN-LC device with the permanent bistable characteristics.

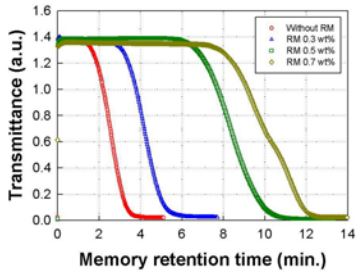

Fig. 1 Measured retention time of π twist state in BCSN-LC cells with the different concentration of RMs

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