Reflective Microlens Array using Cholesteric Liquid Crystals

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Microlens arrays (MLAs) based on liquid crystal play an important role in carious optical systems such as optical communications, three dimensional display due to their controllable focal length [1-3]. Most conventional MLA was evaluated for transmissive type to manipulate the incident light. Eventhough the reflective type lens is necessary for reflective blck optics [4], a reflective MLA were merely reported.

In this study, we demonstrate reflective MLAs using the cholesteric liquid crystals (CLC) [5]. To fabricate a reflective MLA cell, planar substrate and concave polymer substrate were assembled and CLC was injected into the assembled substrates. As a result, the CLC microlens looks as a plano-convex lens because the refractive index of the CLC is greater than that of the polymer. Since the CLC layer, which can reflect a selective circular polarization and transmit the other, works as a selective mirror, the plano-convex CLC lens acts as a biconvex lens with the same curvature. Also we discuss the lens properties of the plano-convex CLC lens such as wavelength selectivity, handedness, and transmissive properties.

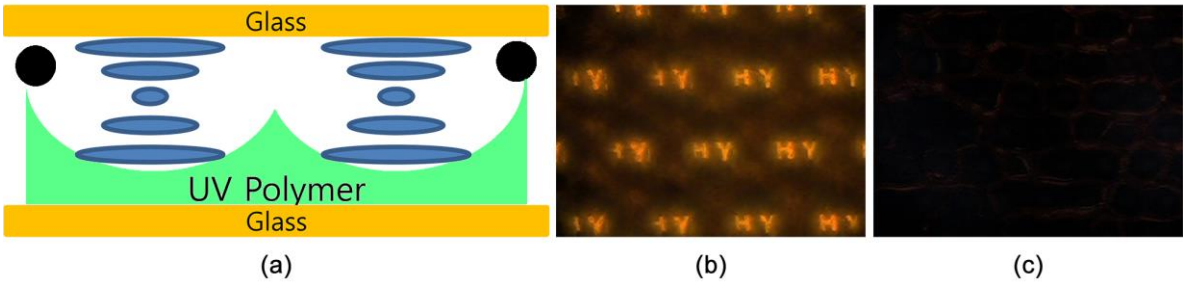

Fig. 1. (a) The schematic diagram of the reflective CLC microlens and the focusing images of the letters "HY" in the reflective CLC lens under (b) right- and (c) left-handed circular polarizers.

Acknowledgment

This work is supported by the National Research Foundation of Korea (NRF) grant funded by the Korea government (MEST) (2012R1A2A2A01046967) and LG Display Co. Ltd.

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