

Reflective Plano-convex Lens using Cholesteric Liquid Crystal

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There are many kinds of liquid crystal lenses for applications like three-dimensional displays, imaging systems, micro-scopes [1-3]. Even though the reflective type lens is necessary for reflective block optics [4] conventional MLA was evaluated for transmissive type.

In this work, we used cholesteric liquid crystal (CLC) to make a reflective lens with plano-convex shape. First, we prepared two substrates. One with a flat surface coated with planar alignment layer and the other with a concave shape polymer which was replicated from convex master and coated with planar alignment layer. And then we assembled the planar substrate and the concave polymer substrate. The empty space between sandwiched substrates was filled with CLC. As a result, a plano-convex lens was obtained since the refractive index of CLC was larger than that of the polymer layer. The plano-convex CLC lens acted like a biconvex lens because the CLC layer worked as a wavelength-selective mirror. The wavelength and handedness of the reflective focused beam coincided with the helical pitch and sense of the CLC, respectively.

References

- [1] Maarten Sluijter et al., *J. Opt. Soc. Am.B:Opt. Phys.* **26**, 2035(2009)
- [2] Mao Ye et al., *Jpn. J. Appl. Phys.* **46**, 6776 (2007).
- [3] M. Ye et al., *Opt. Rev.* **14**, 173 (2007).
- [4] D. Miyazaki et al. *Opt. Lett.* **19**(17), 1281-1283 (1994).