

Advanced Optical Materials / Volume 7, Issue 16 / 1900429

Review

Photoresponsive Structural Color in Liquid Crystalline Materials

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First published: 24 May 2019

<https://doi.org/10.1002/adom.201900429>

Citations: 7

Abstract

Photoresponsive liquid crystalline photonic materials are a medium in which the self-regulation of light can occur. Liquid crystals are macroscopically self-assembling, optically anisotropic materials capable of amplifying photochemical changes and thus are well suited to demonstrate complex light-driven behavior. This review presents recent progress in liquid crystalline systems exhibiting photoresponsive structural color. More specifically, it surveys progress on liquid crystalline materials and structures with coloration that is the result of the constituents' spatial arrangement (not of presence of dyes or pigments) and for which this arrangement can be externally controlled by light. In cholesteric and blue-phase liquid crystals, the structural color results from the natural self-assembly of liquid crystal molecules in periodic structures. Several photochemically driven mechanisms can be exploited to impart color changes to these structures. Photonic liquid crystalline materials can also be generated with directed self-assembly techniques and subsequent processes can be exploited to create photoinduced changes to their optical properties. After reviewing the recent progress in materials based on natural and directed self-assembly, these approaches are compared and contrasted. A few interesting examples of more complex behavior are noted, including true autonomous self-regulation of light flow in liquid crystal systems.

Citing Literature



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