Issue 4, 2016

Previous Next

From the journal:
Soft Matter

Photosensitivity of reflection notch tuning and broadening in polymer stabilized cholesteric liquid crystals

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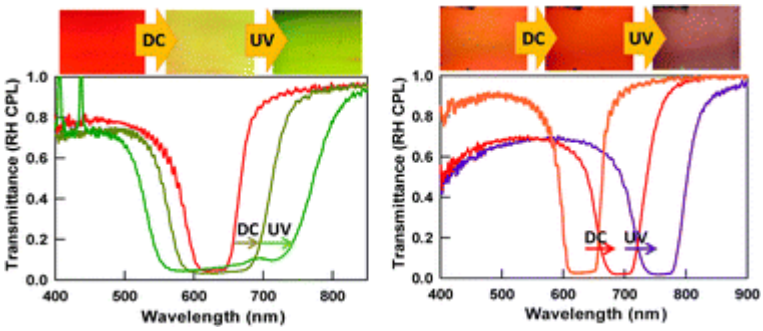
Abstract

The position or bandwidth of the selective reflection of polymer stabilized cholesteric liquid crystals (PSCLCs) prepared from negative dielectric anisotropy ("−Δε") liquid crystalline hosts can be shifted by applying a DC voltage. The underlying mechanism of the tuning or broadening of the reflection of PSCLCs detailed in these recent efforts is ion-facilitated, electromechanical deformation of the structurally chiral, polymer stabilizing network in the presence of a DC bias. Here, we show that these electro-optic responses can also be photosensitive. The photosensitivity is most directly related to the presence of photoinitiator, which is a known ionic contaminant to liquid crystal devices. Measurement of the ion density of a series of control compositions before, during, and after irradiation with UV light confirms that the ion density in compositions that exhibit photosensitivity is increased by irradiation and correlates to not only the concentration of the photoinitiator but also the type. Thus, the magnitude of the electrically tuned or broadened reflection of PSCLC of certain compositions when subjected to DC field is further increased in the presence of UV light. While interesting and potentially useful in applications such as architectural

windows, the effect may be deleterious to some device implementations. Accordingly, compositions in which photosensitivity is not observed are identified.



This article is part of the themed collection: Soft Matter Lectureship Winners

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Article information

https://doi.org/10.1039/C5SM01985K

Submitted
09 Aug 2015

Accepted
13 Nov 2015

First published
23 Nov 2015

Citation
Soft Matter, 2016, **12**, 1256-1261

BibTex Go

Article type
Paper

Spotlight