A Flexible Display Using Dye-Doped PSCT

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Introduction
Recent effort in liquid crystal display (LCD) research has focused on reducing power consumption, making lightweight flexible displays, and reducing manufacturing complexity. The normal mode polymer stabilized cholesteric texture (PSCT) display can be applied to meet these needs since it does not require polarizers or alignment layers. This not only simplifies display fabrication, but it also allows the use of flexible plastic substrates.

Materials and Layout

The PSCT normal mode light shutter consists of a few percent (<10%) of polymer dispersed in a long pitch (>1 μm) cholesteric liquid crystal. The polymer network stabilizes a focal conic domain structure at zero applied field which scatters light. When a field is applied sufficiently high enough to reorient the liquid crystal the display becomes transparent with a large viewing angle.

Materials used in the experiments.
- **a)** monomer RM257
- **b)** photoinitiator BME
- **c)** dichroic dye 1,5-bis-phenylsulfanyl-anthraquinone

Conclusions
This study investigated the effect of adding a dichroic dye to the PSCT mixture. We measured an improvement in the contrast ratio with no increase in power consumption. We demonstrated displays fabricated on patterned flexible plastic substrates.

Pictutres and Results

Data for 2% Monomer & 3% Dye

Data for 2% Monomer & 5.5% Chiral

Transmission vs. Wavelength

Photograph of a plastic display while bent vertically at an 85 mm radius of curvature **a)** bright state (20V) with scenic background and **b)** dark state (0V) with black background **c)** angled view in hand

Spectra of **a)** glass PSCT at 30V, **b)** glass PSCT with dye at 30V, and **c)** plastic PSCT with dye at 20V