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# Droplet configuration control with orange azo dichroic dye in polymer dispersed liquid crystal for advanced electro-optic characteristics

Vandna Sharma<sup>1,2</sup>, Pankaj Kumar<sup>1,2\*</sup>, Amit Sharma<sup>3</sup>, Chinky<sup>2</sup> and Kuldeep Kumar Raina<sup>4</sup>

<sup>1</sup>Chitkara University Research and Innovation Network, Chitkara University, Jhansla, Rajpura, Patiala-140401, Punjab, India

<sup>2</sup>Department of Applied Sciences, Chitkara University Institute of Engineering and Technology, Chitkara University, Jhansla, Rajpura, Patiala-140401, Punjab, India

<sup>3</sup>Arni School of Technology, Arni University, Indora-176401, Himachal Pradesh, India

<sup>4</sup>DIT University, Mussoorie-Diversion Road, Dehradun, Uttarakhand-248009, India

\* Corresponding author: pankaj.kumar@chitkara.edu.in, pkumartiet@gmail.com

## Abstract

Orange azo dichroic dye dependent droplet configuration and electro-optic (EO) characteristics of polymer dispersed liquid crystals (PDLCs) were studied. PDLCs were prepared using a nematic liquid crystal (LC) and UV-curable liquid photopolymer in equal ratio by polymerization induced phase separation (PIPS) technique. Orange azo dichroic dye was taken in different concentrations (wt./wt. ratio) particularly 0.0625, 0.125, 0.25, 0.5 and 1% of the LC mixture to prepare different PDLC samples. In OFF state, bipolar configuration of LC droplets in polymer matrix was observed predominantly for each concentration of dye. In ON state, LC molecules align along the direction of applied electric field and LC droplets configuration shifted to vertical radial configuration in orange azo dichroic dye doped PDLCs at electric field ( $\sim 3\text{V}/\mu\text{m}$ ). Experimental results showed radically improved transmission value ( $\sim 25.4$  a. u.) and contrast ( $\sim 1058$ ) at relatively lower operating electric field ( $3.13\text{V}/\mu\text{m}$ ) with consistent average droplet size  $\sim 4.0\mu\text{m}$ , at lowest (0.0625%) orange azo dichroic dye concentration among all.

**Keywords:** Liquid crystal, polymer dispersed liquid crystal, orange azo dichroic dye, polymerization induced phase separation, droplet morphology, transmission and contrast ratio.

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