

# Improved electro optic response of polymer dispersed liquid crystals doped with oxidized multi-walled carbon nanotubes

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In this work we demonstrate an improvement in the electro-optic performance of thiolene and acrylate based polymer dispersed liquid crystals (PDLC) doped with oxidized multi-walled carbon nanotubes (MWNT) [1]. Experimental results indicate a reduction in switching voltage and faster response times when compared to those with no MWNT. The reduction in switching voltage is attributed to the change in the dielectric properties [2] of the PDLC indicated by an increase in capacitance imparted by the MWNT. The reduction of the switching time is attributed to the reduction in the size of the LC droplets trapped in the polymer matrix, reducing the relaxation time, and is confirmed with scanning electron microscopy images. Comparison of response of PDLC at various doping levels of MWNT indicates that it acts as physical barriers for the counter-diffusing LC during the polymerization induced phase separation and hence anomalous electro-optic behaviour [3] along with shorting of electrodes is observed at high MWNT levels compared to those at low doping levels. This is confirmed using polarised optical microscopy imaging where LC's are found to be trapped at the surface at higher doping levels of MWNT in PDLC. Theoretical reasoning is provided for these results and an optimal MWNT doping level is derived based on experimental observations.

## References:

- [1] M. Havel, K. Behler, G. Korneva and Y. Gogotsi, *Advanced Functional Materials*, **2008**, 18, 2322-2327.  
 [2] G. Chidichimo, G. Arabia, A. Golemme, *Liquid Crystals*, **1989**, 5, 1443-1452  
 [3] A.V. Sadovoy, V.F. Nazvanov, *Technical Physics Letters*, **2006**, 32, 659-660.

## Figures:

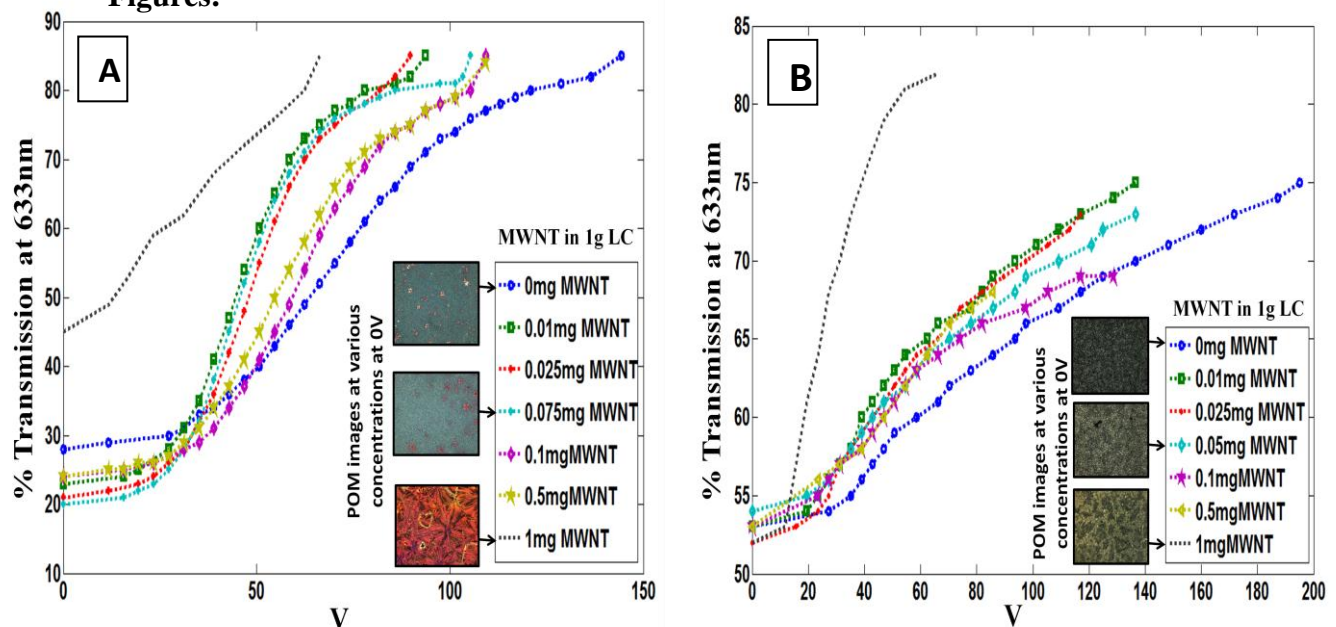


Fig 1: Transmission vs applied voltage plot for PDLC with various MWNT concentration. Inset are the polarized optical microscopy (POM) images for the same. A) Thiolene based PDLC B) Acrylate based PDLC