

Reorientation of single walled carbon nanotubes in negative nematic liquid crystals

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Changes induced in liquid crystal (LC) properties by nanoparticle (NP) doping have attracted interest in the last decade. The anisotropic properties of carbon nanotubes (CNTs) [1] make it interesting to study their reorientation in LC to verify the modifications induced in the electrooptic LC properties and the mutual influence in reorientation between LC and CNTs.

CNT reorientation in positive nematic liquid crystals has been studied by impedance [2] and Raman [3] spectroscopy. Both show the CNTs modify their position from planar to perpendicular when an electric field normal to the cell is applied. The positive LC molecules

perform the same reorientation.

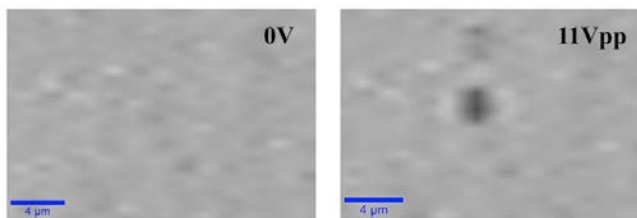


Figure 1. Unswitched and switched CNT planar negative LC cell

A study is being carried out in our lab on the reorientation induced by the electric field in CNT-doped planar and homeotropically oriented negative LC materials. The purpose is to separate

the effect of LC reorientation and electric field on the CNT reorientation. The CNT reorientation is followed by Raman Spectroscopy and the LC orientation is studied in parallel by optical ellipsometry and impedance spectroscopy.

Several interesting results, yet to be confirmed, have been obtained in this study. Planar negative nematics remain substantially unswitched in electric fields, while CNTs switch following the field. A small LC fraction may follow the CNT reorientation.

[1] Basu, R.; Effect of carbon nanotubes on the field-induced nematic switching; *Appl. Phys. Lett.*; 103, 241906-1-3, 2013.

[2] García-García, A., Vergaz, R., Algorri, J.F., Quintana, X. and Otón, J.M.; Electrical response of liquid crystal cells doped with multi-walled carbon nanotubes; *Beilstein J. Nanotechnol.*; 6, 396-403, 2015.

[3] Schymura, S. and Scalia, G.; On the effect of carbon nanotubes on properties of liquid crystals; *Phil. Trans. R. Soc. A*, 371, 20120261-1-14, 2013.