Liquid crystals nanoscience in golden oppurtinities for novel switching

Kaushik Pal[1,*], Sami Sajjadifar[2], M. Abd Elkodous[3], Yakubu Adekunle Alli[4], Fernando Gomes[5], Jaison Jeevanandam[6], Sabu Thomas[7], Alexander Sigov[8]

[1,*]*Bharath University, Department of Nanotechnology, BIHER Research Park, 173 Agharam Road, Selaiyur, Chennai 600073, Tamil Nadu (India).*

[2,]*Department of Chemistry, Payame Noor University (PNU), Ilam, P.O. Box 19395-4697, Tehran, Iran.*

[3,]*Center for Nanotechnology (CNT), School of Engineering and Applied Sciences, Nile University, Sheikh Zayed, Giza, Egypt.*

[4,]*Department of Chemistry, College of Physical Sciences, Federal University of Agriculture, Abeokuta, Ogun State, Nigeria.*

[5,]*Laboratório de Biopolímeros e Sensores/LaBioS Centro de Tecnologia – Cidade Universitária, Rio de jenerio, Brazil.*

[6,]*Department of Chemical Engineering, Curtin University, CDT250 Miri, Sarawak 98009, Malaysia.*

[7,]*International and Inter University Centre for Nanoscience and Nanotechnology, School of Chemical Sciences, Mahatma Gandhi University, Kottayam, Kerala- 686560, India.*

[8,]*Department of Nanoelectronics, MIREA - Russian Technological University, Prospekt Vernadskogo, 78, Moskva 119454 Russian Federation.*

*Corresponding author:

Prof. (Dr.) Kaushik Pal

Research Professor, (Group Leader & Independent Scientist)

Bharath University, Department of Nanotechnology, BIHER Research Park, Chennai 600073.

E-mail: (kaushikphysics@gmail.com);(kaushikpaul.nano@bharathuniv.ac.in)

Abstract.

Liquid crystal (LC) has long been a feature in Materials Science and Nanotechnology, have recently been extended into the appealing domain of complex hybrid materials. The crystalline structural effects of alkoxy chain lengths and the mesogen properties of hydrogen-bonded (n-OBASA) complexes (n=5,6,7) have been investigated in recent studies. The LC-based hybrid nanocomposite materials –obtained by the homogeneous dispersion of zinc oxide nanowires (ZnO NWs) as a dopant into hydrogen-bonded liquid-crystalline (HBLC) compounds– seem to be particularly promising in this article. Optimizing the geometry of surface stabilizing electro-optic, LC cell reveals the typical intermolecular hydrogen bond (H-bond) formation. Here, we explore molecular-colloidal hybrid composite matrix formed from LCs and dilute dispersions of orientation-ordered ZnO NWs, for eventual potential application in smart switchable display devices. In addition, we investigated the structural, dielectric and optical properties of the nanocomposite, and electro-optical studies which were performed by exploiting the potential during the conditions before the opening of spectrum acquisition. Our novel findings confirm that the electric field induces a charge transfer of the LC molecules to the nanomaterial, which acts as a trap for ionic charges. This effect may be utilized to achieve switching that is electro-optically tunable. Such dynamic switching could be harnessed in smart LCD technology and pave the way towards innovative display modulation technology.

Keywords: Liquid crystal; ZnO nanowires; Hybrid nanocomposite; Switchable device

Author's Biography



Prof.(Dr.)Kaushik Pal was born in India. He received his Ph.D. from University of Kalyani, Nadia, (India). Most significant prestigious awards "**Marie-Curie Experienced Researcher (Postdoctoral Fellowship)**" offered by the European Commission at *Aristotle University of Thessaloniki, Greece* and "**Brain Korea National Research Foundation Visiting Scientist Fellowship**" at *CNU, South Korea,* achieved in his career. He was appointed "**Senior Postdoctoral Fellow**" at *Wuhan University* in *China* and after he obtained the most prestigious position "**Scientist & Faculty CAS Fellow**" by *Chinese Academy of Science*. Most recent, he has been working as a "**Research Professor & (Independent Scientist)**", at the *Department of Nanotechnology, Bharath University (BIHER)* at *Chennai*. Based on his research background he selected "Editor-in-Chief" of the International peer reviewed journals and publishers '**Pan-Standford**', **En Press**, and '**InTech**' as well as edited significant numbers of the book chapters, partially reviewed **85-research articles**. Prof. Pal is an excellent group leader as well as associate member in various scientific communities, reorganizations and professional bodies. Since last year organized and chairperson around **12-National/ International** events/ symposiums/ conferences/workshops and himself contributed around **8-Keynote** & **25-Invited lectures** and attained distinguish chief guest in worldwide Nanoscience research community.