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Reliable optoelectronic switchable device implementation by liquid crystals

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Abstract

Enhancing the performance of high luminescent and dielectrically capable cadmium sulfide nanowire (CdS NW) is of great importance, because of their promising ability in analyzing the dimensionality and size. The tuned physical characteristics of semiconductor CdS NWs allowed the manipulation of both electronic and optoelectronic devices at the Nano scale by dispersing a new bent core (BC) liquid crystal (LC) compound. This was derived from a 4-chlororesorcinol central core unit with two terephthalate based rod-like units carrying chiral (S)-3, 7-dimethyloctyloxy (namely 'CPDB') terminal chains, which have been synthesized in a pure solvo-chemical process. The mesomorphic properties of the newly-prepared bent-core LC, exhibiting an enantiotropy 'Sm A' phase as a result of dispersing 0.005% of CdS NWs were investigated by several spectroscopic investigations. In addition, the hydrothermal fabrication of CdS NWs with a high-yield was modified with a cationic agent, cetyltrimethyl ammonium bromide (CTAB), which was utilized as a compatibilizer for providing a better interaction with LC molecules and giving a homogeneous solution. This work focused on the experimental investigation and optimization, using a combinational view of bent-core liquid crystal (CPDB) compound dispersion which was achieved in a controllable manner. The product of the resulting composite matrix has a very outstanding and promising behavior, e.g. semiconductor nanostructures emission polarization that can be manipulated using an external bias modulation of the novel switchable device, which was found quite convincing in the recent trends of brand-new technologies. In particular, the electro-optic responses by POM of various mesophases were investigated from the view point of the CdS incorporated bent-core LC matrix formation and transitional phase variants of 'ON' and 'OFF' states, which were depending on the geometrical parameters of CdS NW's. Finally, the future challenges and prospects of any other nanomaterial's dispersed into CPDB compound which will give rise to an increase of the mesomorphic range by preserving the mesosphere type were explored in detail.

Keywords: Bent-Core Liquid Crystal (CPDB) Compounds, Cds Nanowires, Dielectric Properties, Electro-Optical, Switchable Devices

Biography

Prof.(Dr.) Kaushik Pal received his Doctorate (Ph.D.) in Physics (Nanoscience and Materials Science) from University of Kalyani, INDIA. He is the leading Chair professor as well as Chief-Scientist in Wuhan University China. He is the "Distinguish Visiting Professor" at Federal University of Rio de Janeiro, Brazil acting as a Chair Professor and Group Leader (Chief-Scientist & Faculty Fellow) position in Wuhan University, China. He worked as a "Visiting Professor" at IIUCN, Mahatma Gandhi University, Kottayam, Kerala. Received his Ph.D. from University of Kalyani. Prof. Pal has been conferred Honoris Causa (D.Sc) Doctorate nominated by the Higher National Youth Skill Institute, (IKTBN) Sepang (Govt. of Malaysia).Most significant prestigious awards "Marie-Curie Experienced Researcher(Postdoctoral Fellow)"offered by the European Commission in Greece and "Brain Korea Fellowship" as leading Scientist. He was "Senior Postdoctoral Fellow" at Wuhan University, China and within a year achieved a prestigious position "Chief-Scientist & Faculty (CAS) Fellow" by Chinese Academy of Science.

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