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Switchable, Self-assembled CdS Nanomaterials Embedded in Liquid Crystal Cell for High Performance Static Memory Device

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Abstract.

Enhancing the performance of static memory as well as the reliability of electro-optical switchable devices, based on nanomaterials dispersed liquid crystals (NDLC) cells offers a unique alternative choice owing to their cost-effective assembly. In this letter, we exhibit a simple, one-step bench top synthesis of uniform luminescent nanowire with ≈40-65 nm diameter and 2 μm in length. Those are controllably converted into nanowire's feather (d≈10-13 nm), core shell nanosphere (d≈453nm), or (≈248 nm×206 nm) nanorectangle, which can exist in aqueous solution of ethylenediamine (EDA), a liganding solvent which enables a high temperature, one-step, bench top decomposition of $([Cd(en)_2]^{2+}$complexes.The resulting product has a very unique and useful behavior e.g. the polarization of the emission from controllable semiconductor nanowires. The large magnitude of band gap tunability (3.5 to 3.7 eV), polarization anisotropy, spontaneous polarization, electro-optical switching, response time and high contrast ratio of 83% can be quantitatively interpreted most significant in terms of the dielectric contrast between semiconductor nanomaterials and LC complex. In contrast, LC produces a rich variety of complex, controlled three dimensional structure of orientation ordering of constituent anisotropic molecules that can be varied by external fields. One of the recent key breakthroughs explores in this article organizing this switchable device progress as static memory, including optical switches, integrated photonic devices in the next generation.

Key words: CdS; Nanocomposite; Casting; AFM; Optical; Electrical

1. Introduction