Title: Carbon nanotube dispersed liquid crystal: a nano-electromechanical system and non-volatile memory effect

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Abstract

The self-organizing properties of nematic liquid crystals (LC) can be used to template carbon nanotubes (CNTs) on a macroscopic dimension. The nematic director field, coupled to the dispersed CNT long-axis, enables controlled director reorientation using well-established methods of LC alignment techniques, such as patterned-electrode-surface, electric fields, and magnetic fields. Electric field induced director rotation of a nematic LC+CNT system is of potential interests due to its possible applications as a nano electromechanical system. The relaxation mechanism for a LC+CNT composite, on the removal of the applied field, reveals the intrinsic dynamics of this anisotropic system. Dielectric hysteresis and temperature dependence of the dielectric constant coherently shows the ferroelectric-type behavior of the LC+CNT system in the nematic phase. The strong surface anchoring of LC molecules on CNT walls results in forming local isolated *pseudo-nematic* domains in the isotropic phase. These domains, being anisotropic, respond to external fields, but, do not relax back to the original state on switching of the field off, showing non-volatile memory effect.