Charge transport in C_{60} doped discotic liquid crystals

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Discotic liquid crystal (DLC) materials have many potential applications in organic/molecular electronic devices such as field effect transistors (1). The highly anisotropic electrical conduction in these systems is particularly interesting; however the mobilites observed in pure materials are too low for many applications. The DLC used is Hexakis(n-hexyloxy)triphenylene (HAT6) which in its pure form has a mobility of order $10^{-4}cm^2/Vs$ (2). We are considering ways of modifying electrical conduction of these systems by incorporating nanoparticles into the DLC. Incorporating C_{60} molecules changes the texture of the liquid crystal and alters the phase transition temperatures.

Measurements are made of the I-V characteristics, optical texture and time-of-flight transits, for both pure HAT6 and mixed systems. Time of flight measurements are used to give information about the progress of a thin sheet of charge through the sample (3). By comparison to pure DLC systems information can be gained about the mobility and the trapping of charge carriers. The I-V characteristics of cells made with these materials are non-Ohmic showing space charge limited transport, the I-V curves are also strongly influenced by the alignment of the sample. Future work will include investigating systems of HAT6 mixed with thiol coated Au nanoparticles.

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