Terahertz Spectroscopy of Photoconducting Liquid Crystals

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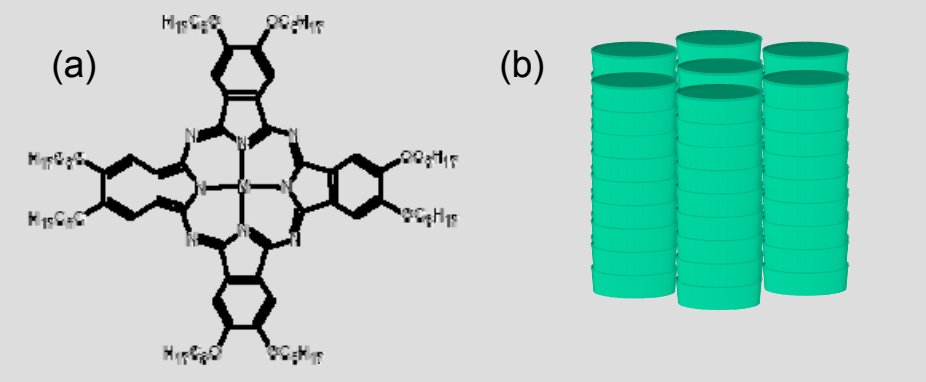

Liquid Crystals (LC) are a relatively new class of photoconductors. Surprisingly high carrier mobilities approaching that of amorphous silicon have been reported in LCs. Although their high molecular order has been recognized to play an essential role, the mechanism of charge transport in LCs are still not well understood.

We investigated a model discotic material phthalocyanine (Pc) (a). These disk-like molecules self-assemble into columns (b), creating quasi-one-dimensional channels for efficient charge transport. There exists a liquid crystalline phase, in which the core molecules remain ordered while the side chains are free to move.

The conductivity in Pc following excitation of a femtosecond optical pulse was measured by terahertz time-domain spectroscopy (c). The frequency dependence of the complex conductivity (d) was extracted through Fourier transforms of the THz electric-field transients (c) recorded without and with the photoexcitation.

Comparison of the frequency dependence together with a temperature dependence of the complex conductivity to transport models is underway to interpret the nature of charge transport in this material.