

# New Chiral Discotic Liquid Crystals: Derivative of TCQ having a chiral alkyl side chain



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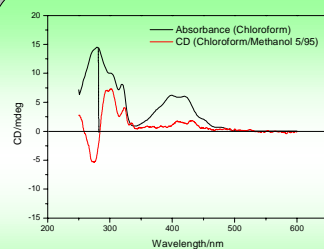
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## Introduction

Tricycloquinazoline (TCQ-6C) has been found to function as a core fragment for a new family of discotic mesogens having C<sub>3</sub> symmetry and six aliphatic side chains.

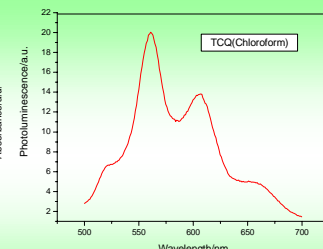
Introduction of alkyl side chains to TCQ-6C was done to modify the thermal properties and to allow processing [1,2]. The substitution strategy was used to stabilize LC mesophases & bring down the clearing temperature of TCQ discotics.

Here, we describe a synthetic route towards a branched alkyl chain substituted TCQ-6C having a asymmetric carbon which is a five step procedure. It is of physical interest especially for a potential application as electron acceptor in electronic devices.



UV-Vis/CD spectrum of TCQ-6C

in solution



Fluorescence Spectra of TCQ-6C

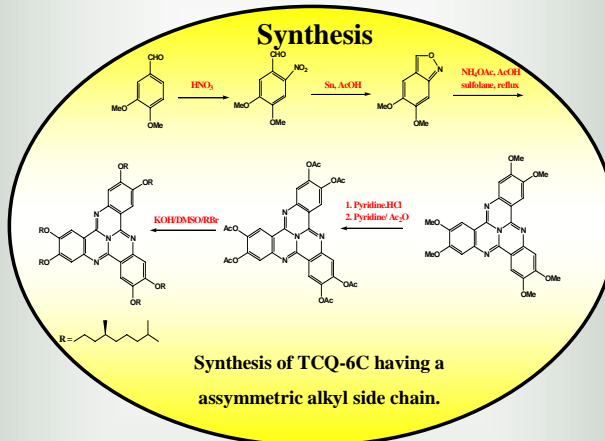
in Chloroform

## Optical texture of TCQ-6C



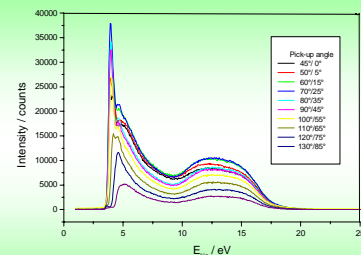
Polarizing microscopic image of the mesophase of TCQ-6C

## Synthesis

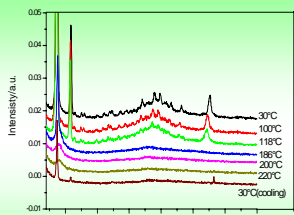


Synthesis of TCQ-6C having a asymmetric alkyl side chain.

## UPS Spectrum of TCQ-6C



Valence electron spectrum of TCQ of thin film of the modeled compound. The incident photon energy is 23 eV.



Temperature dependence X-ray diffraction pattern of TCQ-6C

In the low angle region, three sharp peaks, one very strong and two weaker reflections, are seen whose *d*-spacing are in the ratio of 1:1/√3:1/√4. The 2θ values for the three sharp peaks at low angles conform to a two dimensional hexagonal lattice spacing of 27 Å. The high angle peak is due to the stacking of the rigid cores within a column giving a core-core separation of 3.26 Å.

## Reference

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- S. Kumar, E. J. Wachtel, *J. Org. Chem*, 1993, 58, 3821-3827.
- P. G. Schouten, J. F Van Der Pol, *Mol. Cryst. Liq. Cryst*, 1991, Vol 195, 291-305

## Results & discussion

TCQ-6C having a chiral alkyl side chain was synthesized successfully. The nature of the LC mesophase was studied by DSC, polarizing microscopy and X-ray diffraction.

TCQ-6C forms a columnar LC mesophase (Cr 118°C, Col<sub>h</sub> 191°C, Iso). CD measurements display a strong bisignate CD-signal between 250 nm and 325 nm, which indicates the chiral coupling of the chromophores in the LC mesophase. A weak monosignate CD effect was observed in the region of the long wavelength absorption (400-450 nm). Cyclic voltammetry displayed an first oxidation wave at 0.67 V and a Reduction wave at -1.55 V (CH<sub>2</sub>Cl<sub>2</sub> against Ag/AgCl). The optical bandgap for comparison is observed at 2.48 eV.

UPS provided not only the characters of the valence band structure but also the parameters like ionisation potential and combined with absorbtion spectroscopy, electron affinity that are of crucial importance in designing optimised OLED configurations

Cr = Crystal; Col<sub>h</sub> = Hexagonal Columnar Liquid Crystalline Phase; Iso= Isotropic

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