

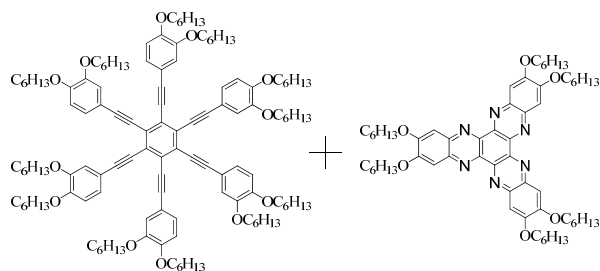
Powder X-ray Diffraction Study of Complementary Polytopic Interaction of Discotic Liquid Crystals

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Discotic liquid crystals have been extensively investigated during past decades. They usually exhibit columnar and nematic mesophases. For columnar mesophases, molecules can self-assemble into one dimensional aggregation, which attributes to high charge mobility. Moreover, they are excellent candidates for device applications due to their unique physical and electronic properties.

To investigate complementary polytopic interaction^{1,2} of discotic liquid crystals, we blend donor (Triphenyls series) and acceptor (HATs series) to induce new mesophase or modify the property of liquid crystal. We speculate that along the column, molecular should exhibit anti-ferroelectric correlation and it would stabilize mesophases.



Scheme 1: The blending donor (Triphenyls series) and acceptor (HATs series)

X-ray diffraction studies confirmed the mesophase assignment made by POM and DSC. The pattern (Fig. 3 and Table 1) shows a strong maximum in the low angle region that corresponds to the (100) reflection from the two dimensional hexagonal lattice with a lattice constant $a = 27.49 \text{ \AA}$. Other two small peaks can be indexed to the (110) and (200) reflections, confirming the Col_h assignment. At the wide-angle region, two diffuse scattering maxima were observed, corresponding to a distance of approximately 4.58 and 3.41 $\text{\AA}$, typical of the interchain halo and intracolumnar π - π stacking distances respectively. We have demonstrated that

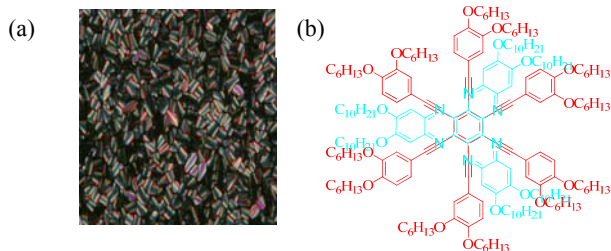


Fig. 1: (a) Fan-shaped microscopic texture upon cooling process, showing the typical hexagonal columnar mesophase, (b) Possible mechanism of the complementary polytopic Interaction of discotic liquid crystals.

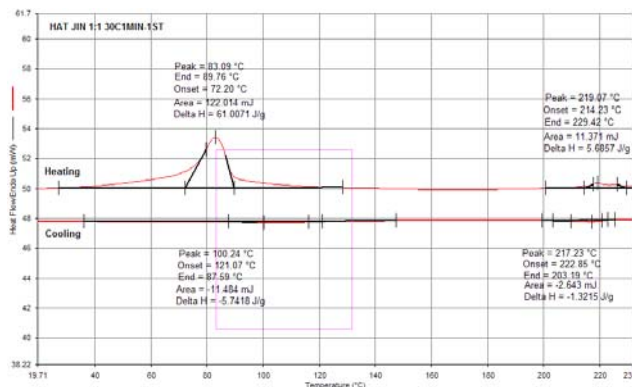


Fig. 2: First cycle of DSC scan of the complementary polytopic liquid crystal. And the the second cycle could not be seen, maybe for the extremely ordered column so that the entrophy was too small.

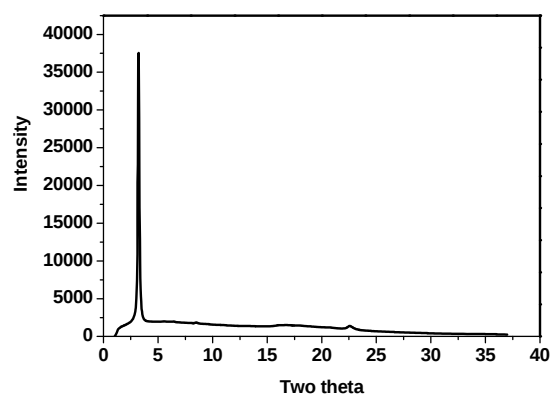


Fig. 3: Powder X-ray diffraction pattern at room temperature

Table 1: Variable-Temperature XRD Data for the compound

compd.	temp.(°C)	d-spacing(Å)	Miller indices(hkl)	lattice constants(Å)
CPI	rt	23.81	(100)	$a=27.49$
		13.82	(110)	
		11.91	(200)	
		8.99	(220)	
		4.58	alkyl halo	
		3.41	core-core	

The complementary polytopic interaction of discotic liquid crystal has made the intracolumnar distance become shorter.

The interaction between the compound with donor (Triphenyls series) and acceptor (HATs series) was still investigated.