

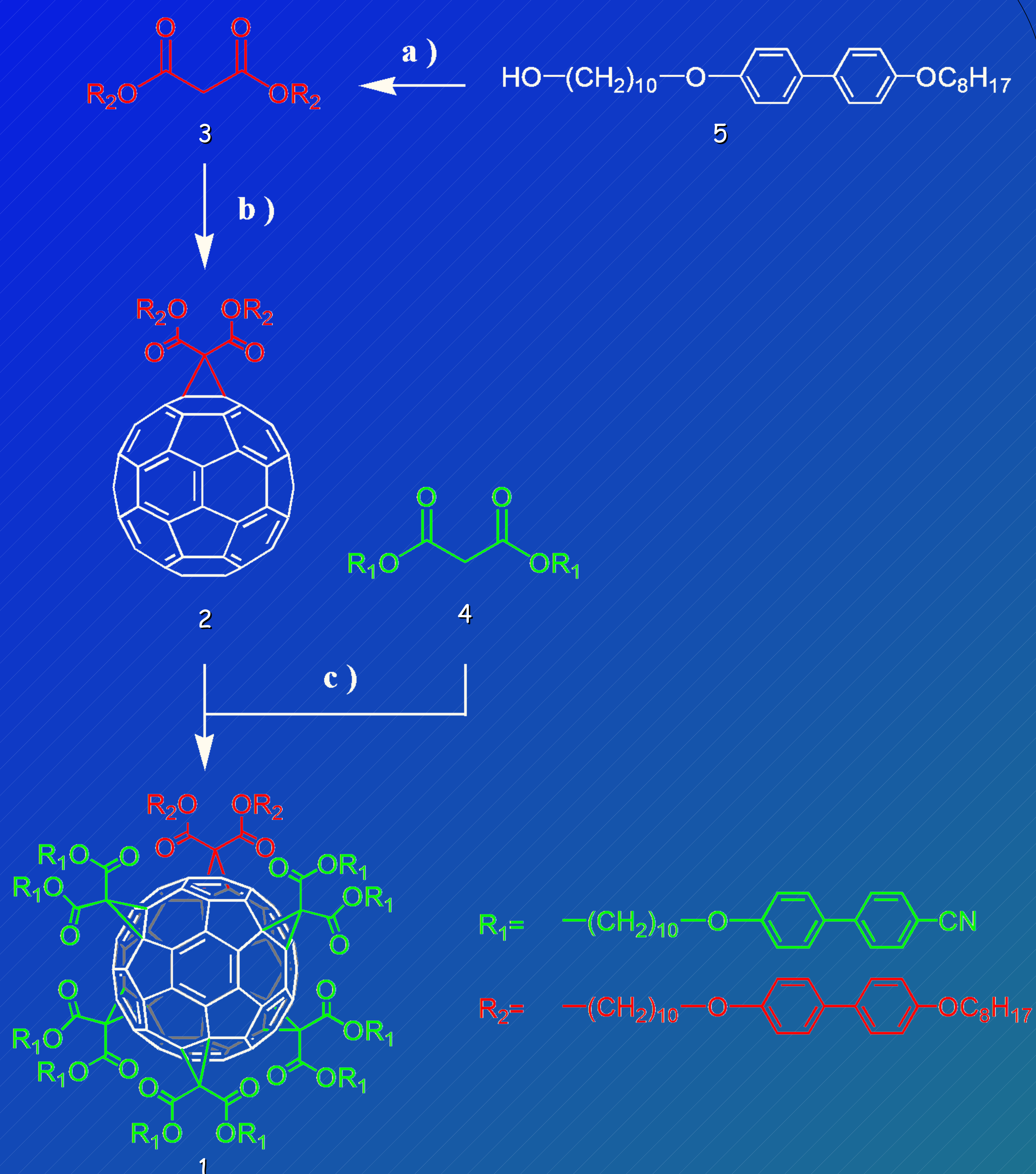
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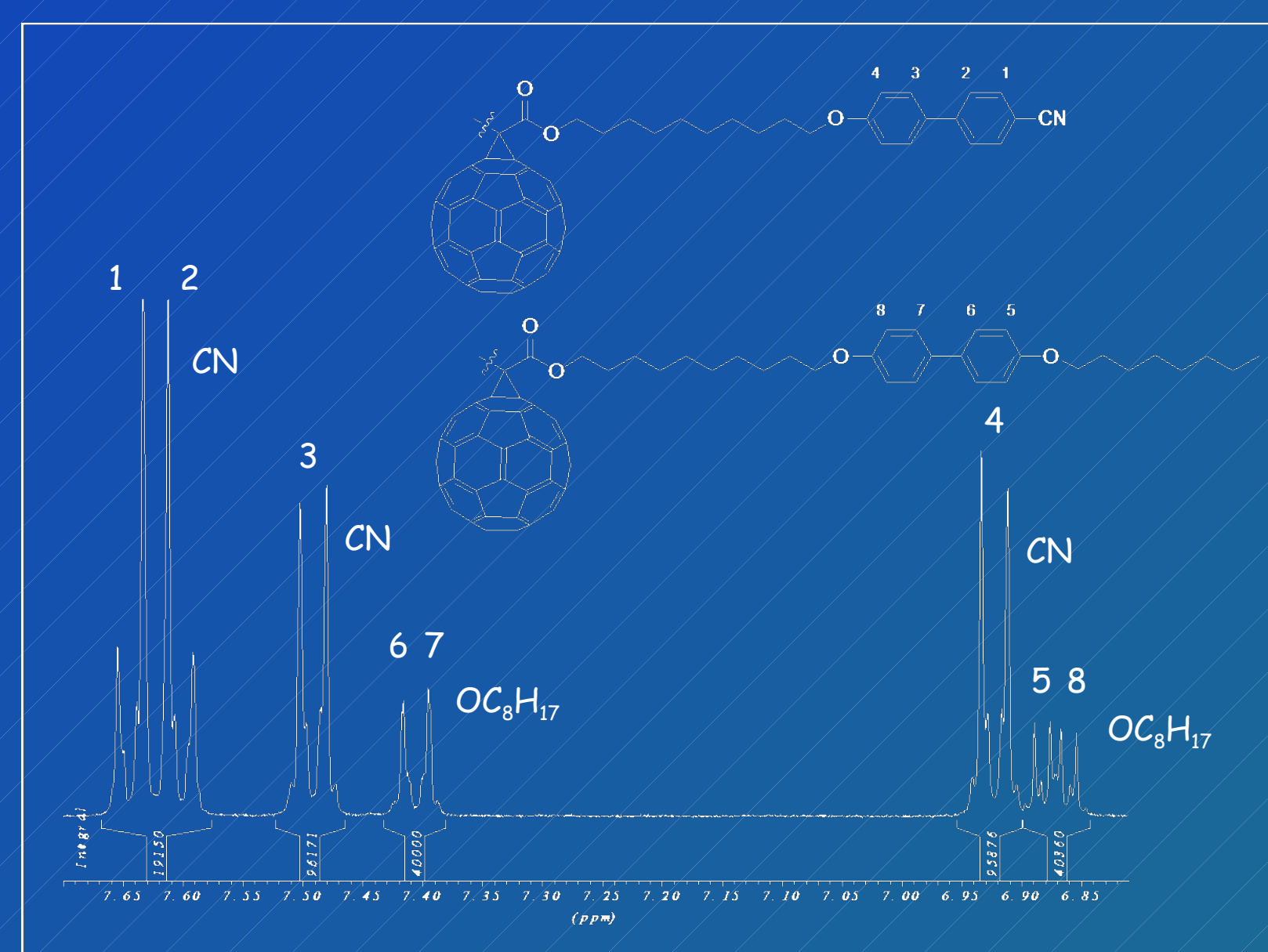
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A liquid-crystalline mixed [5:1]hexa-adduct of [60]fullerene was synthesized by addition of two different malonate derivatives onto C₆₀. The hexa-adduct derivative was prepared via a stepwise synthetic procedure (fullerene → mono-adduct of C₆₀ → hexa-adduct of C₆₀). Cyanobiphenyl and octyloxybiphenyl derivatives were used as mesogens. The malonate derivatives showed either a monotropic nematic phase or a monotropic smectic A phase, and the hexa-adduct derivative gave an enantiotropic smectic A phase.

✓ Synthesis

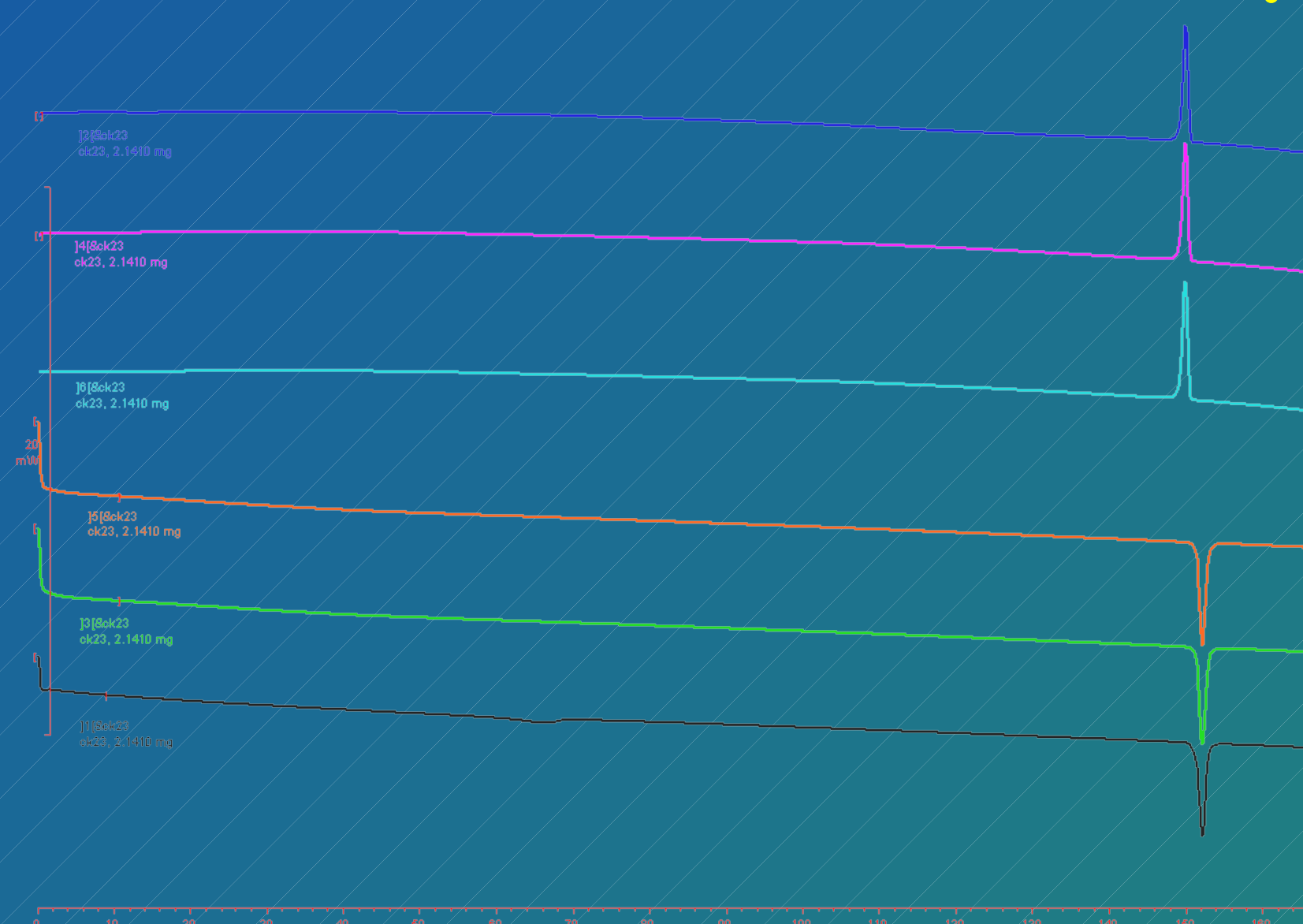


✓ Portion of NMR spectra



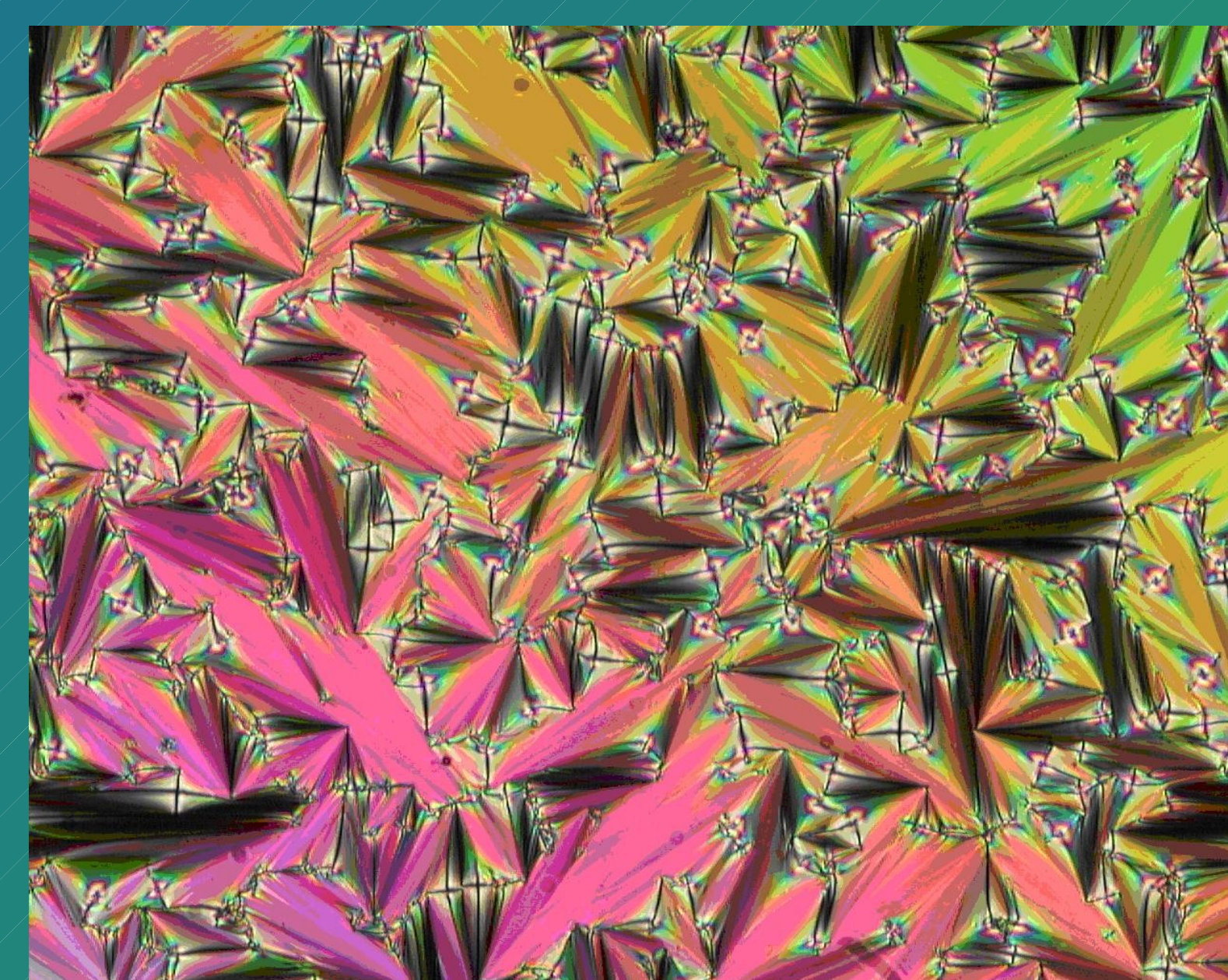
NMR spectroscopy was found to be a powerful tool for the identification and characterization of our materials.

✓ DSC spectra

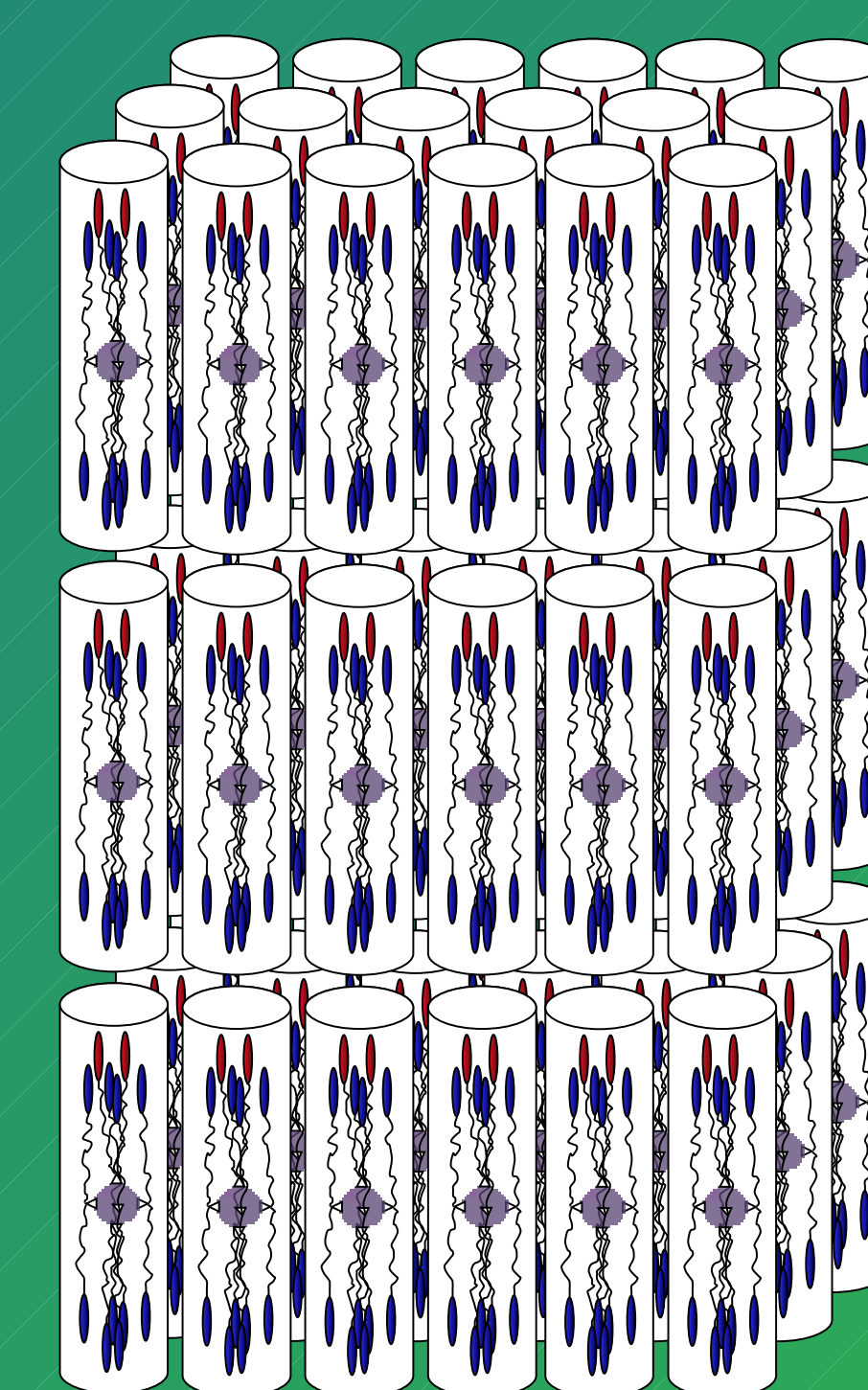


The hexa-adduct material gave rise to reversible transitions.

✓ POM texture and Proposed model for the supramolecular organization of 1



Typical texture observed for the smectic A phase.



✓ Phase-Transition Temperatures and Enthalpy Changes of Compounds 1-4

Compound	T _g /°C	Transition	Temperature (°C)	ΔH/kJ·mol ⁻¹
4 ^[1]	-	(I → N)	87	2.7
		(N → Cr)	57	50
3	-	(I → SmA)	115	21.6
		(SmA → Cr)	114	12.3
		(Cr → Cr')	111	37.7
2	-	Cr → I	112	43.1
1	80	SmA → I	151	55.5

Temperatures are given as the onset of the peaks; T_g = glass transition temperature, I = isotropic liquid, N = nematic phase, SmA = smectic A phase, Cr = crystal. Monotropic transitions are given in parentheses.

✓ Conclusion

We have demonstrated that liquid-crystalline mixed [5:1]hexaadducts of C₆₀ can be readily synthesized. Interestingly, poly-addition can be used for the preparation of fullerene-containing thermotropic liquid crystals from different mesogens. This result opens the door for the design of polyfunctional fullerene materials.

References related to this project

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