Supporting Information

In our study, the DIO material was synthesized following a previously reported literature protocol (ref 1) as is shown in the scheme below:

***trans*-DIO**

In a 100 ml round bottom flask under nitrogen and in an ice bath was placed 2’,3,4,5-tetrafluoro-1,1’-biphenyl-4’-ol (2.40 g, 9.80 mmol), a [1:5] mixture of *cis* and *trans* isomers of 2,6-difluoro-4-(5-propyl-1,3-dioxan-2-yl) benzoic acid (3.19 g, 11.0 mmol), DCC (4.20 g, 20.0 mmol) and DCM (40.0 ml). This mixture was stirred for thirty minutes in the ice bath, DMAP (0.40 g, 10.0 mol%) was added and then the mixture was allowed to warm to room temperature and left stirring overnight. After this time, the reaction was found to be complete by TLC. The reaction mixture was vacuum filtered, the filter cake was washed with DCM, and the filtrate was adsorbed on silica gel which was placed at the top of a column and eluted with a mixture of ethyl acetate and hexanes (gradual gradient of ethyl acetate from 2-10%). Fractions containing the isomeric products of different polarities were combined and concentrated separately. The less polar trans product was found in earlier fractions followed by a mixture of *cis* and *trans* products in later fractions. All the products were recrystallized from hexanes. Yield- 2.07 g (42 %) only *trans-DIO*; 1.26 g (25 %) *cis-DIO* + *trans-DIO* (1:16 ratio).

Reference:
Zhou et. al. J. Mater. Chem. C. 2022, 10, 8762. doi.org/ 10.1039/d2tc00862a

NMR data for only the *trans* DIO isomer

^{19}F NMR (470 MHz, CDCl$_3$) δ -108.49 (d, *J* = 9.1 Hz), -114.36 (t, *J* = 9.8 Hz), -134.18 (dd, *J* = 20.9, 8.4 Hz), -161.08 – -161.24 (m).
^{1}H NMR (500 MHz, CDCl$_3$) δ 7.44 (t, *J* = 8.6 Hz, 1H), 7.24 – 7.14 (m, 6H), 5.41 (s, 1H), 4.30 – 4.23 (m, 2H), 3.55 (dd, *J* = 12.2, 10.8 Hz, 2H), 2.22 – 2.10 (m, 1H), 1.42 – 1.31 (m, 2H), 1.16 – 1.07 (m, 2H), 0.95 (t, *J* = 7.3 Hz, 3H).
^{13}C NMR (126 MHz, CDCl$_3$) δ 161.97, 161.92, 160.35, 159.91, 159.87, 159.30, 159.28, 158.35, 152.22, 152.14, 150.99, 150.91, 150.20, 150.16, 150.12, 145.70, 145.62, 145.54, 140.53, 138.52, 130.79, 130.67, 130.64, 124.35, 124.25, 118.15, 118.12, 113.29, 113.27, 113.25, 113.14, 110.75, 110.54, 110.40, 110.37, 110.21, 110.19, 109.42, 98.81, 98.79, 98.77, 72.58, 33.88, 30.22, 19.52, 14.18.

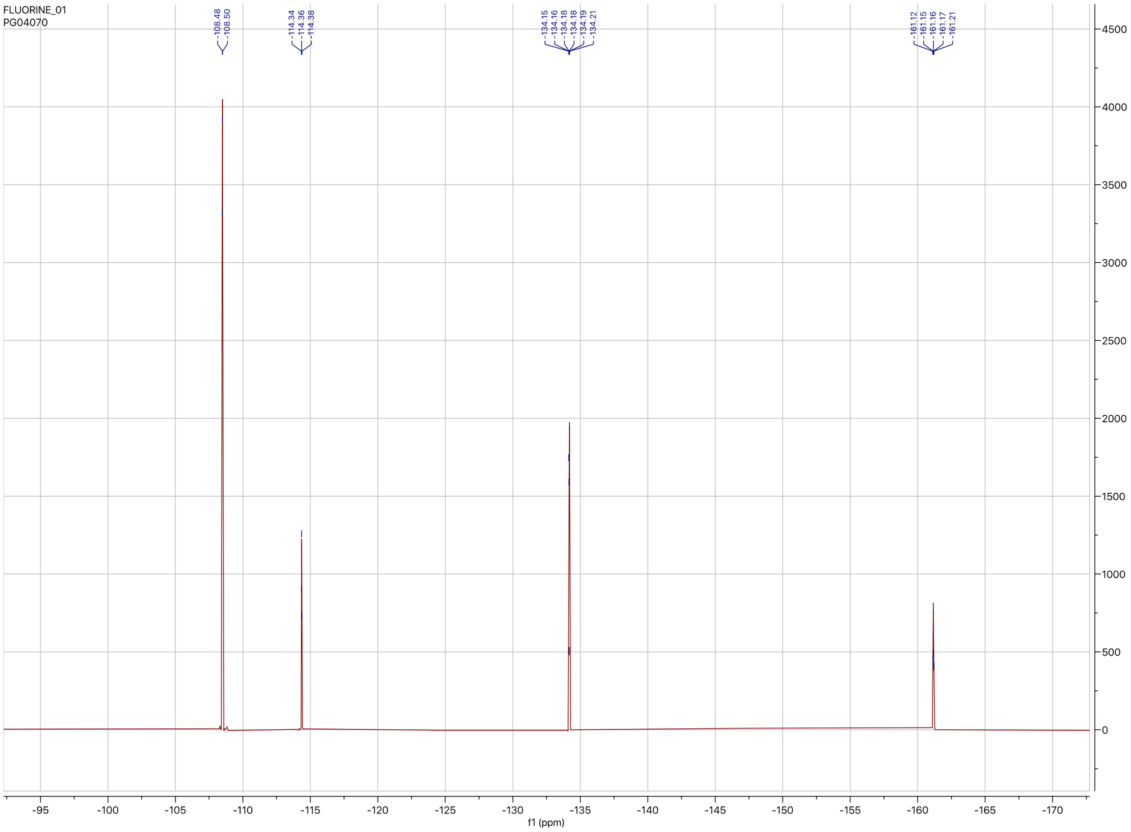

Figure 1. *^{19}F-NMR of DIO (trans only)*

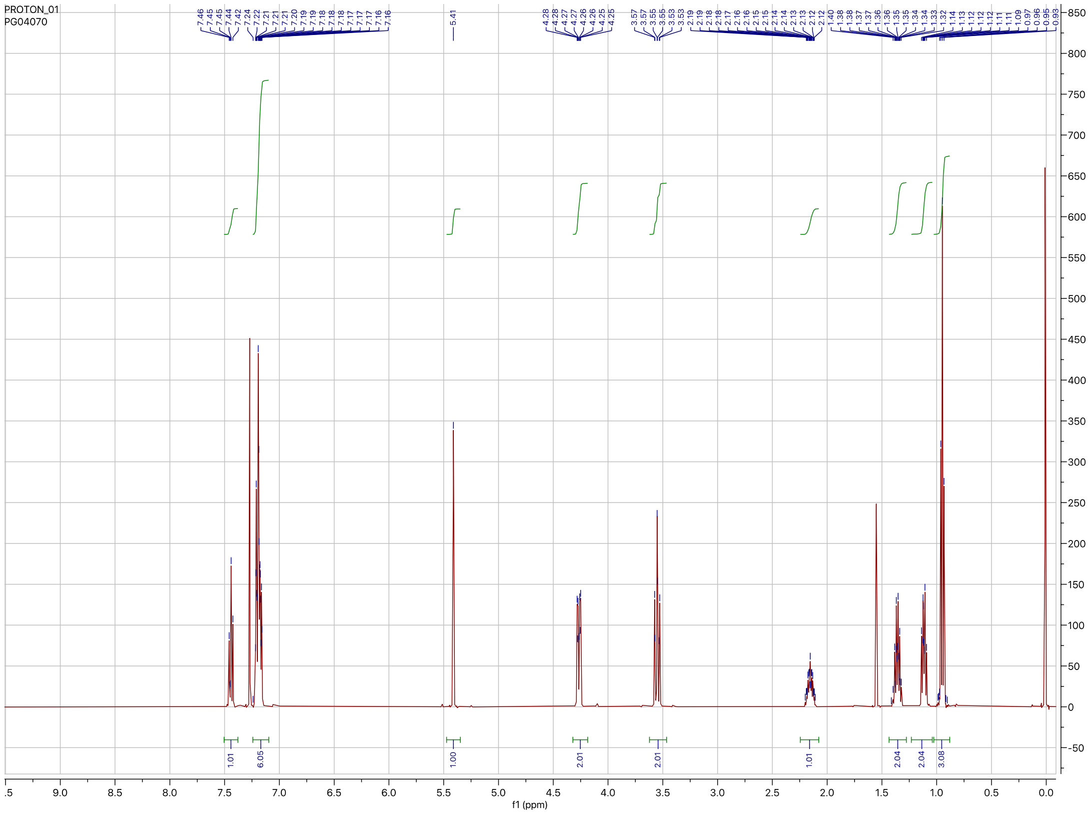

Figure 2. *^{1}H-NMR of DIO (trans only)*

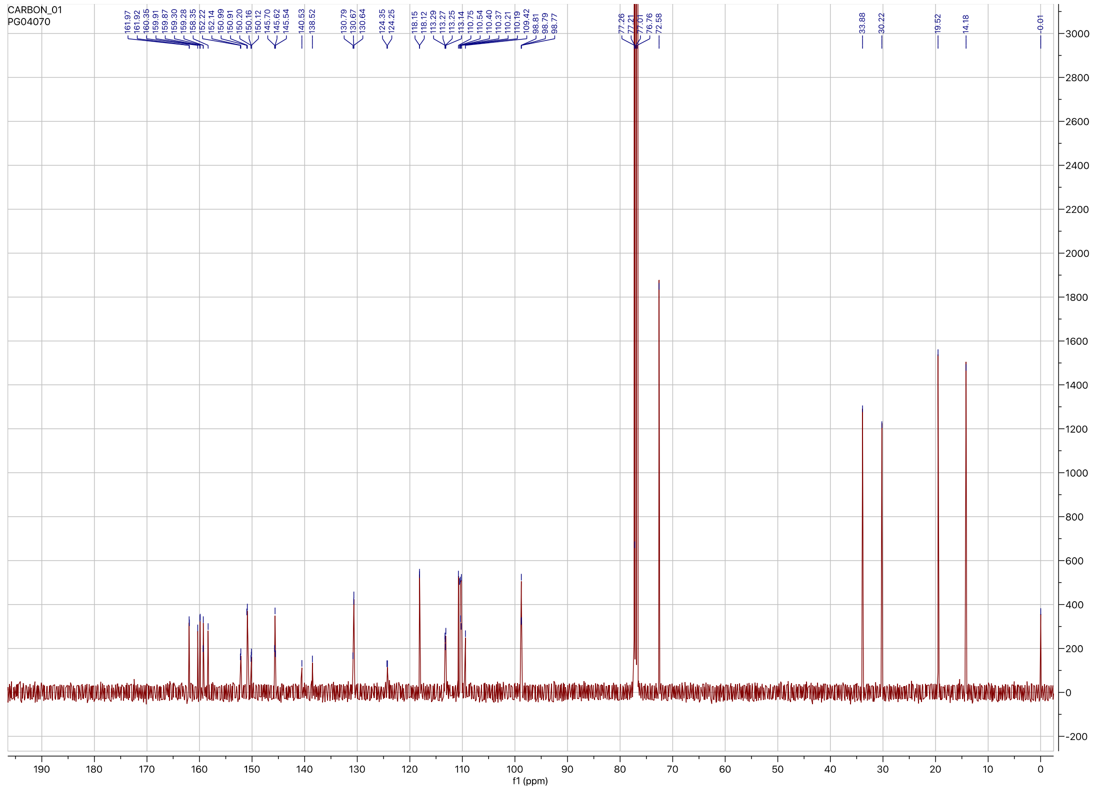

Figure 3. *^{13}C-NMR of DIO (trans only)*

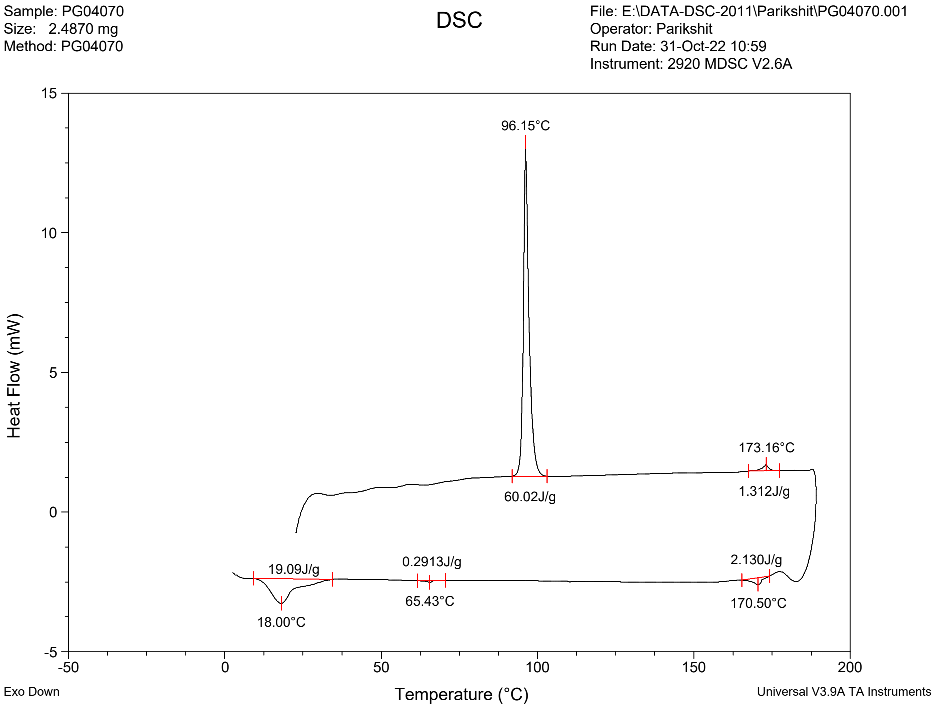

Figure 4. *DSC, first cycle at 10ºC/min (trans only).*

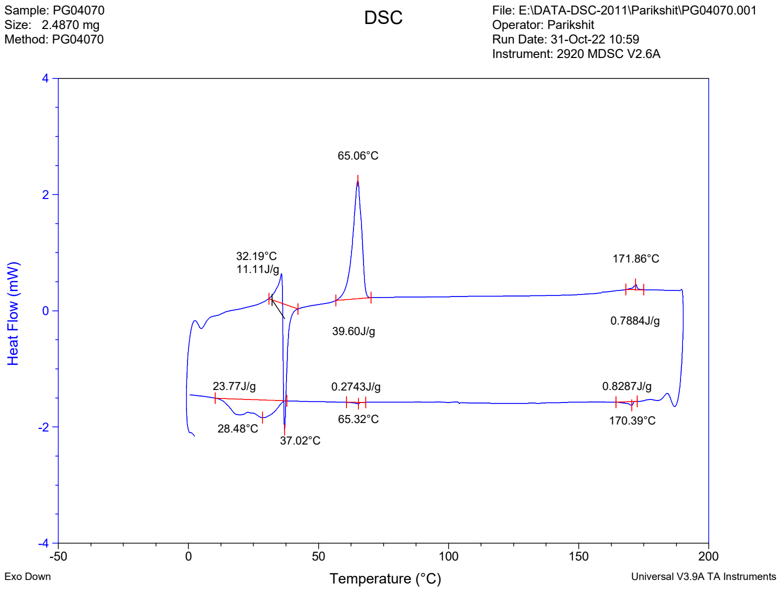

Figure 5. *DSC, second cycle at 5°C/min*

POM images

Various POM images of the magnetic field induced Freedericksz transition in the SmZ$_a$ phase. Images both above and below the threshold field, for both increasing and decreasing magnetic field. The polarizers have lesser extinction at shorter wavelengths, so fully dark POM is not observed. At this temperature the threshold field is 2.1T

The first four images are increasing H.
The last three are decreasing H.

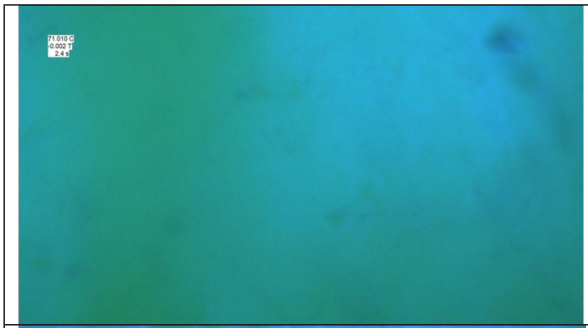	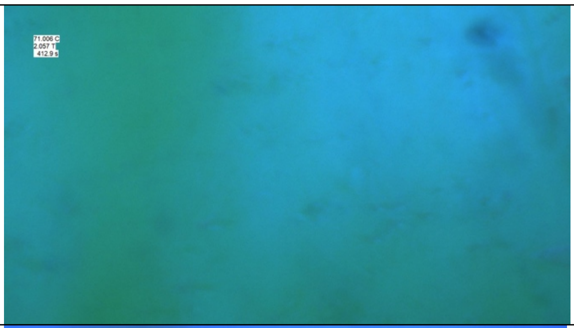
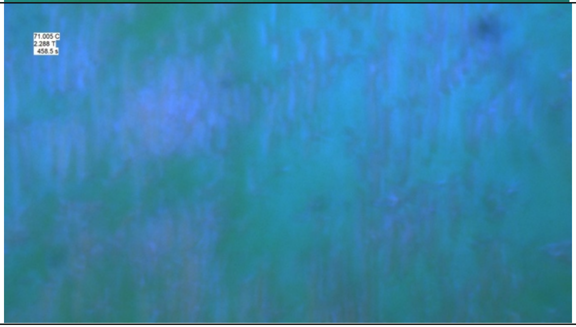	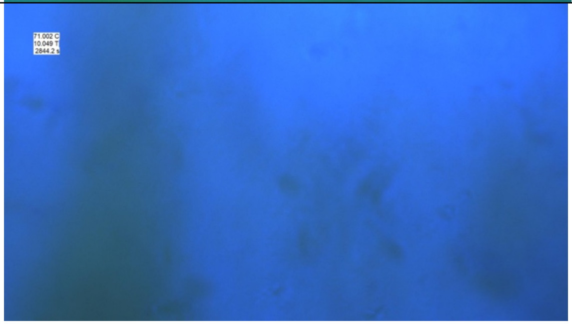
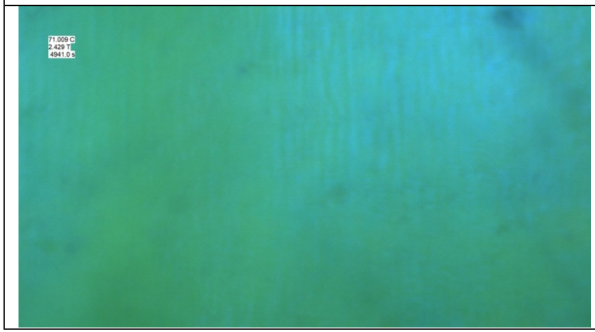	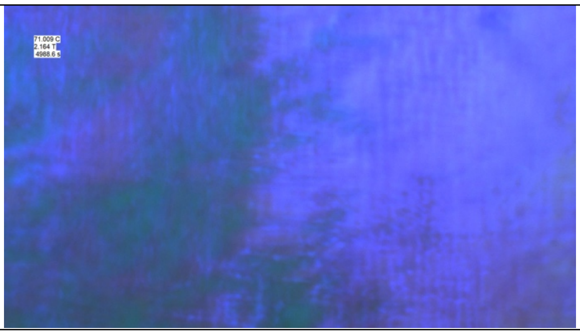

	

Figure 6: *POM images at various magnetic fields (labeled in image inset)*