Electronic Supplementary Information

Effect of methoxy group instead of polar group in the nematic phase of four-ring bent-core liquid crystals

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1 Procedure for the Synthesis of the compounds GK1 and GK2

(4′-methoxy phenyl azo) phenyl-4-yl 3-[N-(4′-n-heptyloxy-2-hydroxybenzylidene) amino]-2-methyl benzoate (GK1): 2-Methyl-3-N-(4-n-butyloxy-2-hydroxybenzylidene) amino benzoic acid (0.65g, 2mmol) and 4-hydroxy-4′-methoxy azobenzene (0.456g, 2mmol) were dissolved in dry dichloromethane (DCM) (50ml) and catalytic amount of 4-dimethylaminopyridine (DMAP) (4mg,0.02mmol) was added to the solution. A solution of N, N′-dicyclohexylcarbodiimide DCC (0.49g, 2.4mmol) was added to the reaction mixture and the mixture was stirred for 48 h under inert atmosphere at room temperature. The precipitate of N, N′-dicyclohexylurea was removed by filtration and the solvent DCM was evaporated to get crude product. The crude product was purified by column chromatography using silica gel (60-120 mesh) with hexane/chloroform (9:1) as eluents. The yellow solid was recrystallized several times from absolute ethanol to get the pure product. Yellow solid, Yield: 0.81 g (69.9%). IR υ_{max} in cm^{-1}: 3194($\upsilon_{O-H,}$ H-bonded), 1730 ($\upsilon_{C=O}$, ester), 1604 ($\upsilon_{C=N}$, imine). ^{1}H-NMR (400 MHz, $CDCl_3$): (δ_H), 13.35 (s, 1H, **-OH**), 8.35 (s, 1H, -C**H**=N-), 7.91 (dd, 1H, J = 2.0 Hz, J = 7.6 Hz, **ArH**), 7.87 (dd, 2H, J = 1.6 Hz, 6.8 Hz, **ArH**), 7.84 (dd, 2H, J = 2.0 Hz, J = 7.2 Hz, **ArH**), 7.32 (t, 1H, J = 8.8 Hz, **ArH**), 7.30 (d, 1H, J = 8.4 Hz, **ArH**), 7.29 (dd, 1H, J = 2.0 Hz, J = 7.2 Hz, **ArH**), 7.24 (d, 2H, J = 8.4 Hz, **ArH**), 6.95 (dd, 2H, J = 2.0 Hz, J = 7.6 Hz, **ArH**), 6.51 (dd, 2H, J = 2.0 Hz, J = 6.8 Hz, **ArH**), 3.98 (t, 2H, J = 6.8 Hz, **-OCH$_2$-**), 3.84 (s, 3H, **-OCH$_3$-**), 2.61 (s, 3H, Ar-**CH$_3$**), 1.75 (q, 2H, J = 6.8 Hz, - C**H$_2$-**), 1.40-1.28 (m, 8H, **-(CH$_2$)$_4$-**), 0.87 (t, 3H, J = 6.8 Hz, **-CH$_3$**). Elemental Analysis calculated for $C_{35}H_{37}N_3O_4$: C, 72.52; H, 6.43; N, 7.25 % Found: C, 72.89; H, 6.39; N, 7.64%.

(4′-methoxy phenyl azo) phenyl-4-yl 3-[N-(4′-n-octyloxy-2-hydroxybenzylidene)amino]-2-methyl benzoate (GK2): Yellow solid, Yield: 0.84 g (70.8%). IR υ_{max} in cm^{-1}: 3192 ($\upsilon_{O-H,}$ H-bonded), 1730 ($\upsilon_{C=O}$, ester),1604 ($\upsilon_{C=N}$, imine). ^{1}H-NMR (400 MHz, $CDCl_3$): (δ_H), 13.41 (s, 1H, **-OH**), 8.38 (s, 1H, **-CH**=N-), 7.91 (dd, 1H, J = 2.0 Hz, J = 7.6 Hz, **ArH**), 7.87 (dd, 2H, J = 2.0 Hz, 6.8 Hz, **ArH**), 7.85 (dd, 2H, J = 2.0 Hz, J = 7.2 Hz, **ArH**), 7.32 (t, 1H, J = 8.4 Hz, **ArH**), 7.30 (d, 1H, J = 8.0 Hz, **ArH**), 7.29 (dd, 1H, J = 2.0 Hz, J = 7.6 Hz, **ArH**), 7.02 (d, 2H, J = 8.4 Hz, **ArH**), 6.95 (dd, 2H, J = 2.0 Hz, J = 7.2 Hz, **ArH**), 6.53 (dd, 2H, J = 2.0 Hz, J = 6.8 Hz, **ArH**), 3.98 (t, 2H, J = 6.8 Hz, **-OCH$_2$-**), 3.84 (s, 3H, **-OCH$_3$-**), 2.65 (s, 3H, Ar-**CH$_3$**), 1.75-1.29 (m, 10H, **-(CH$_2$)$_6$-**), 0.89 (t, 3H, J = 6.8 Hz, **-CH$_3$**). Elemental Analysis calculated for $C_{36}H_{39}N_3O_4$: C, 72.83; H, 6.62; N, 7.08 % Found: C, 72.96; H,6.54; N,7.33%.

2 Additional textures

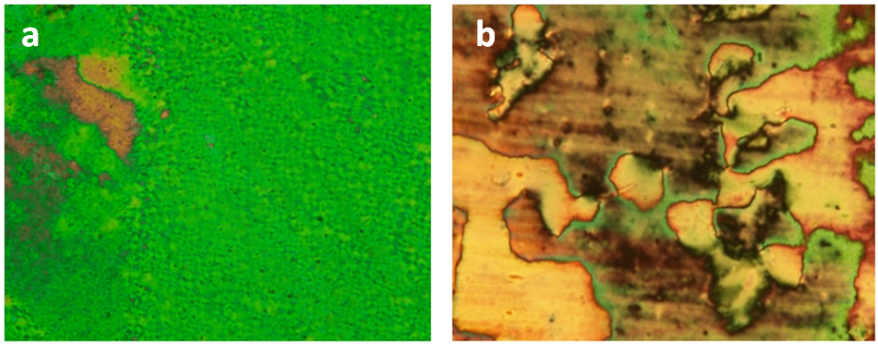

Fig. S1 Microphotographs showing (a) schlieren texture of GK1 at 165°C, and (b) of GK2 at170.1°C.

3 Additional dielectric information

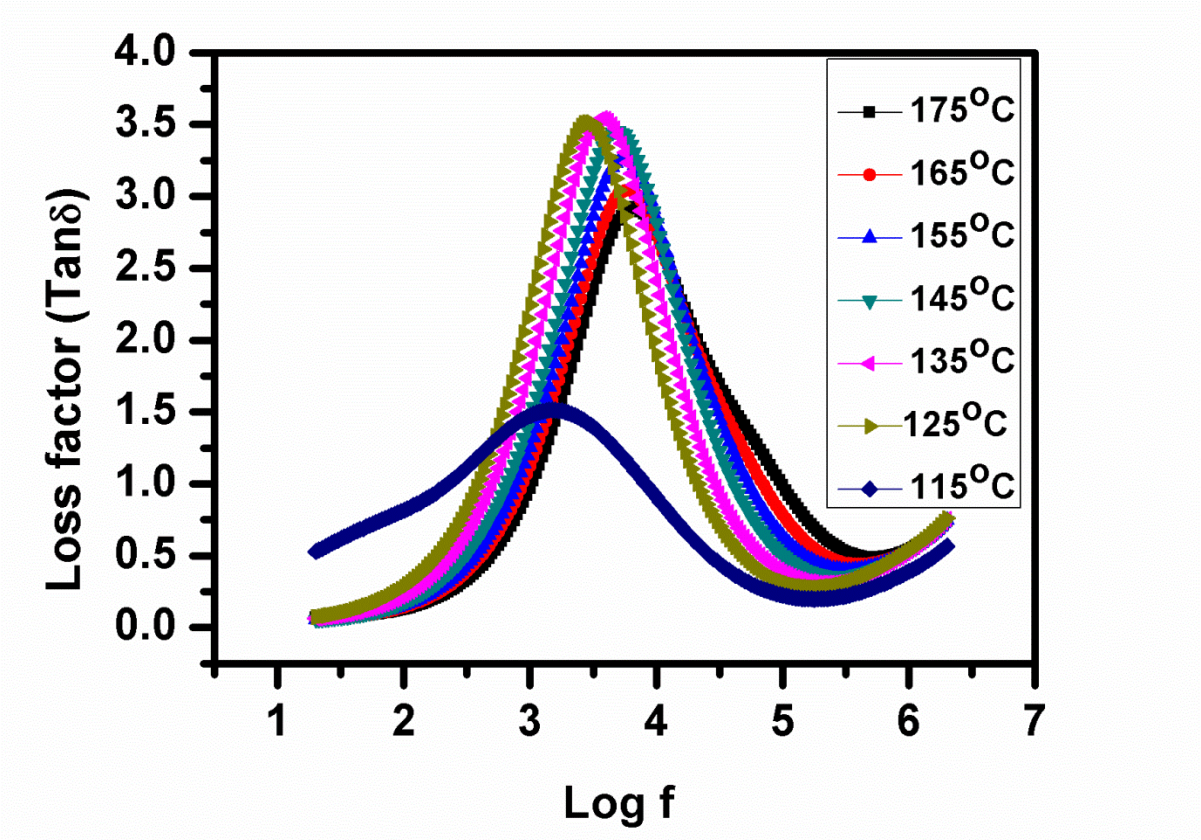

Fig. S2 The loss factor (tan δ) curves as a function of frequency at different temperature carried out in sample GK1 using 7.7 µm thick cell.

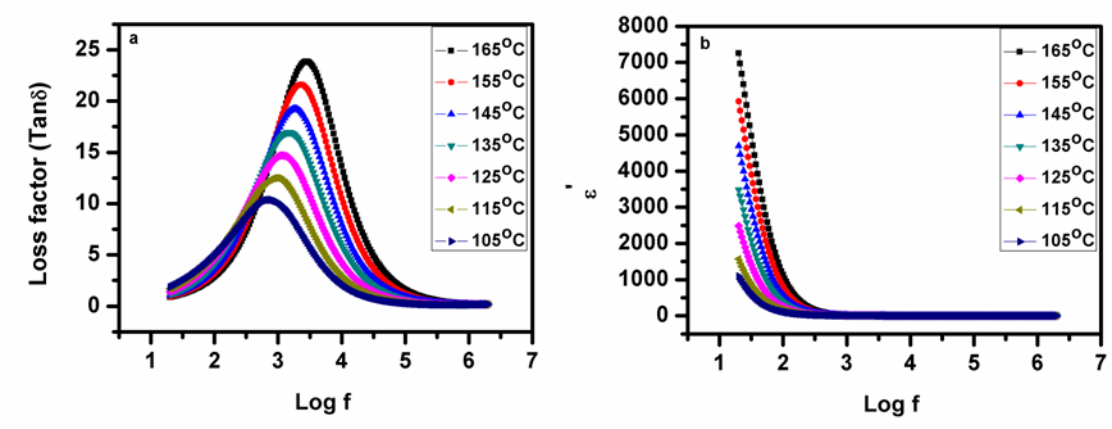

Fig. S3 Investigation of sample GK2: (a) the loss factor (tan δ) curves as a function of frequency at different temperature, (b) dielectric permittivity (real part) as a function of frequency at different temperatures.

4 Electro-optical studies

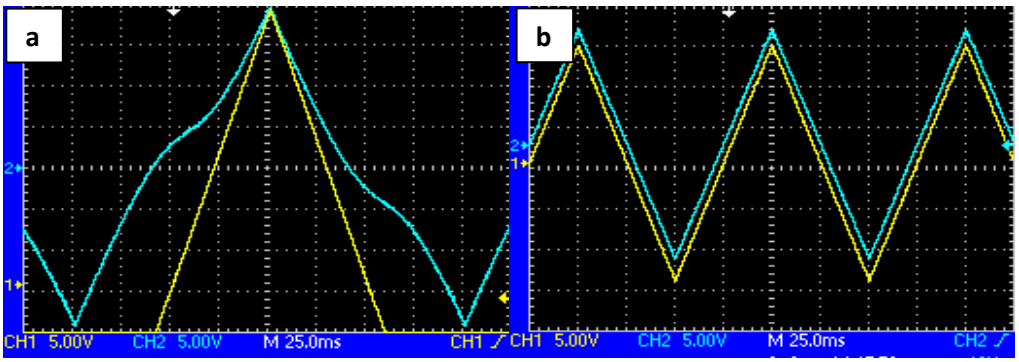

Fig. S4 Investigation of sample GK1 and GK2: (a) the current response of GK1 at 155°C in a 3.2 µm ITO-coated cell with homogeneous alignment under a triangular wave field with 70Vpp and 5Hz, (b) the current response of GK2 at132.5°C in a 3.2 µm ITO-coated cell with homogeneous alignment under a triangular wave field with 30Vpp and 10Hz.

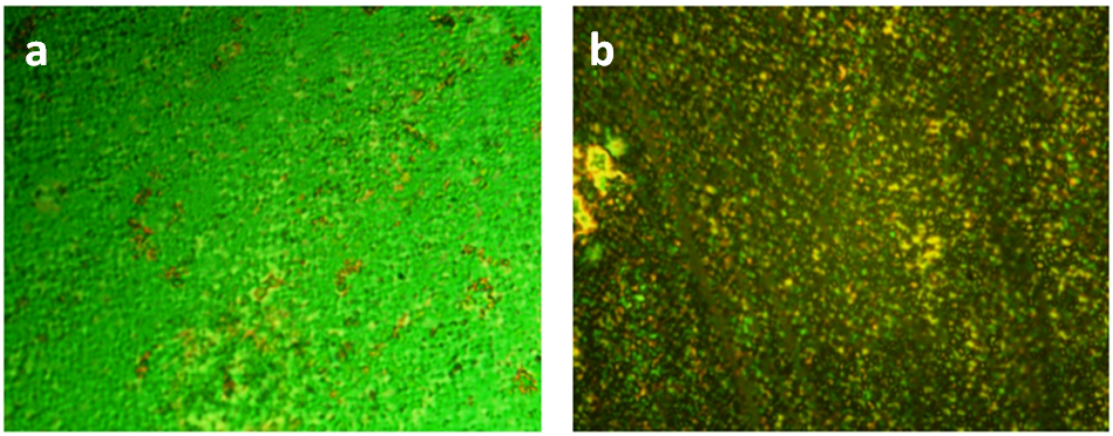

Fig. S5 Texture of (a) GK1 at 50Vpp, 10Hz and (b) of GK2 at 70Vpp, 20Hz applied ac electric field