Supporting information

Functional liquid crystalline gels through multi-scale hierarchical self-assembly of laponite and amidodiol

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Fig. S1: Structure of laponite

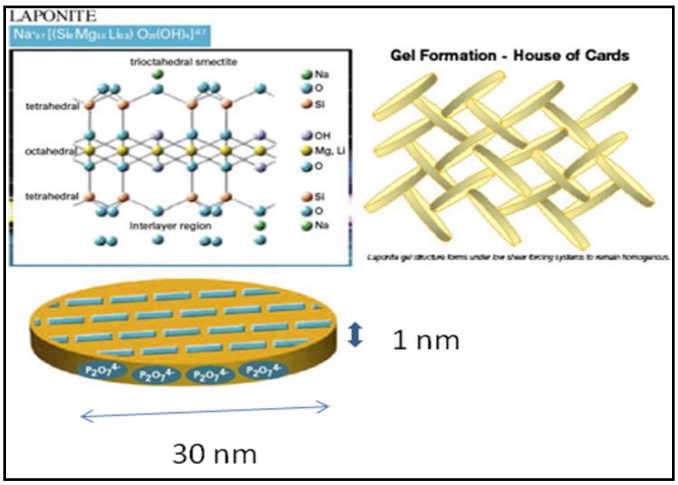
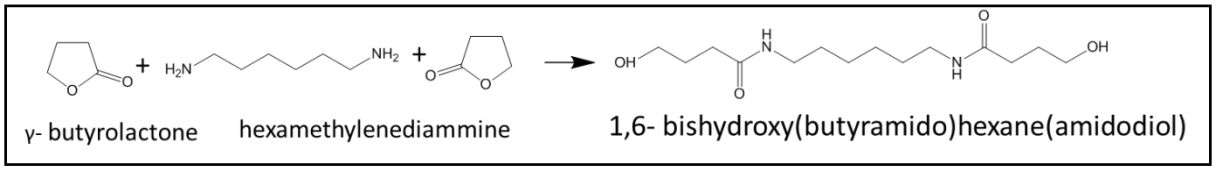


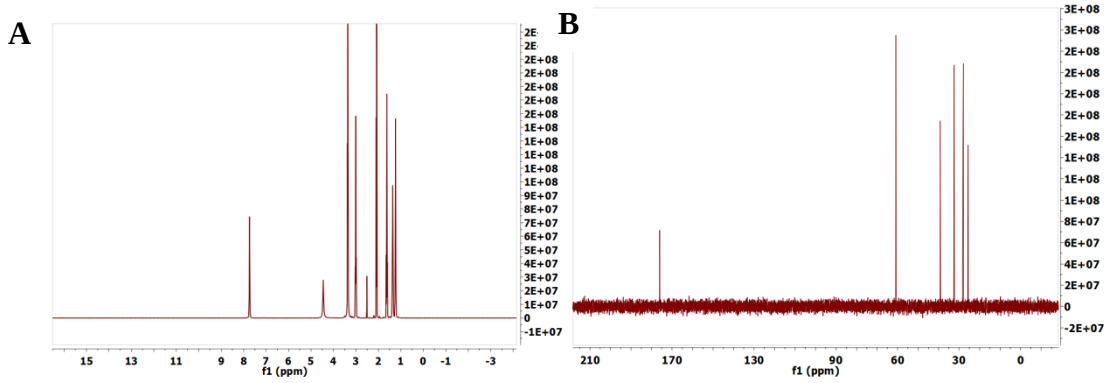
Fig. S2: Scheme of synthesis of 1,6 bis(hydroxybutyramido) hexane (amidodiol)



Amidodiol (1, 6-bis (hydroxybutyramido) hexane) was prepared by the aminolysis of γ–butyrolactone using hexamethylenediamine. Typical procedure is as follows: A solution of 0.2 mol (17.2g) of γ-butyrolactone in 10 mL of isopropanol was taken in a conical flask and cooled in ice bath at 5 ˚C. A solution of 11.62g (0.1mol) of hexamethylenediamine in isopropanol was added drop wise with stirring for two hours(800 rpm) and kept overnight. Formation of the product was confirmed using TLC in a 7:2:1 benzene, methanol, triethylamine mixture. White crystalline solid formed was filtered and

washed several times with isopropanol, then dried in vacuum. Further, it was recrystallized from 150 mL of methanol and acetone mixture.

Fig. S3: (A) ^{1}H NMR and (B) ^{13}C NMR spectra of 1,6-bis(hydroxyl butyramido) hexane(amidodiol)



^{1}H NMR spectra of amidodiol (δ, ppm): 7.7 (s, - CONH-), 4.4 (2H, s, -OH), 3.35 (4H, t, -CH_2OH), 3.01 (4H, t, -CH_2NHCO-), 2.10 (4H, t, -NHCOCH_2-), 1.60 (4H, m, - CH_2CH_2OH), 1.35 (-NHCH_2CH_2-), 1.23 (-NH $CH_2CH_2CH_2$-). ^{13}CNMR Spectra of amidodiol (δ, ppm): 177(- CONH-), 60.6 (-CH_2OH), 38.9 (-CH_2NH-), 32.2 (-CH_2CONH-), 28.7 (-CH_2CH_2NH-), 27.5 (-CH_2CH_2OH), 25.4 (-$CH_2CH_2CH_2$NH-). FT-IR spectra of AMD showed bands at 1636 cm^{-1}, 1526 cm^{-1}, 3298 cm^{-1} and 3053 cm^{-1} and are attributed due to the amide and hydroxyl groups, respectively.

Table S1: Experimental details for the preparation of FLAGs

Sample	Weight of laponite(g)	Weight of amidodiol(g)	Water (ml)	Appearance
FLAG1	0.05	0.004	2	Soft transparent gel
FLAG2	0.05	0.006	2	Soft transparent gel
FLAG3	0.05	0.008	2	Soft transparent gel
FLAG4	0.05	0.01	2	Soft transparent gel
LAP	0.05	----	2	Soft transparent gel

Fig. S4: Schleiren nematic texture of laponite gel

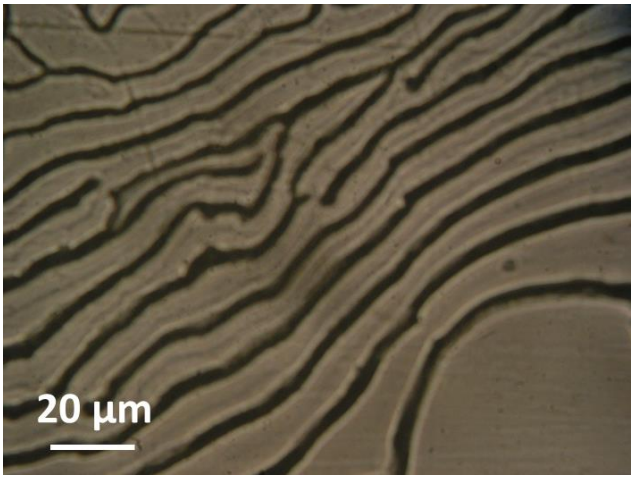


Fig. S5: Three dimensional network formation of laponite discs

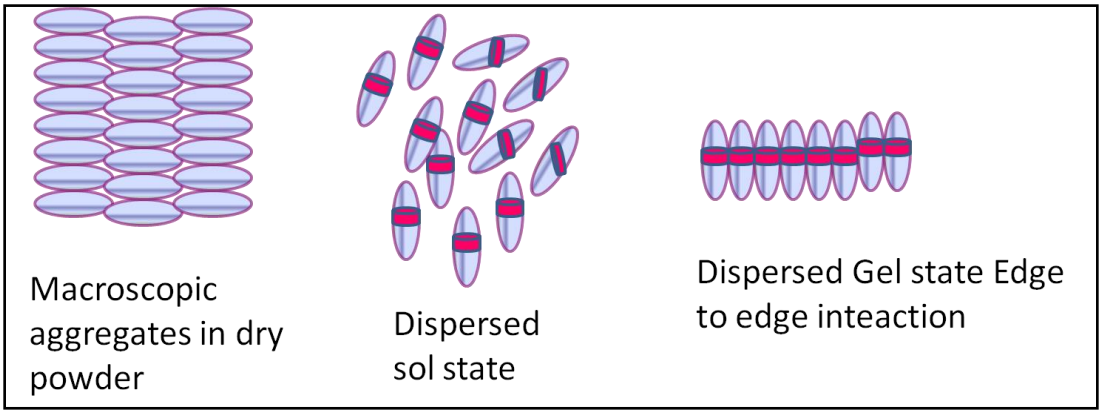


Fig. S6: SEM image of laponite

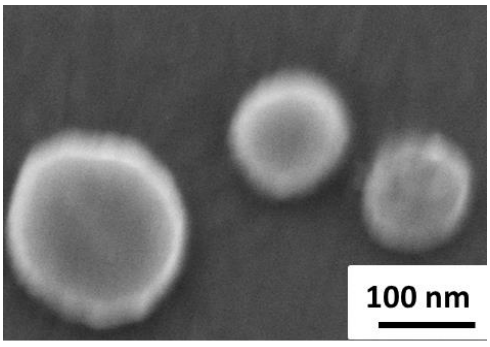


Fig. S7: (a) PLM and (b) SEM images of amidodiol (AMD)

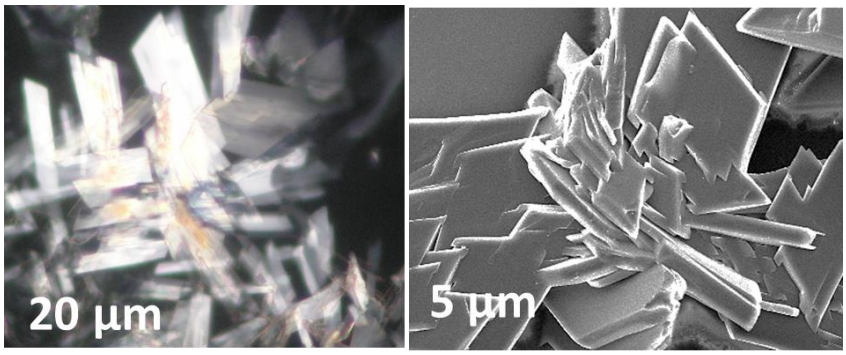


Fig S8: The stress strain curves of LAP, FLAG3 and FLAG4.

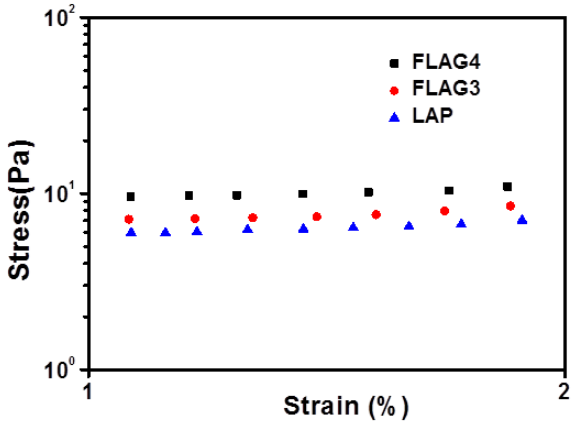


Fig. S9: Amplitude sweep of FLAG1, FLAG2, FLAG3and FLAG4

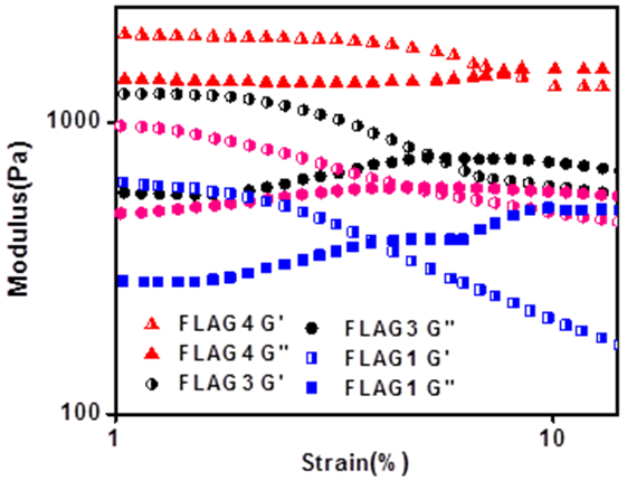


Fig. S10: Variation of storage modulus of FLAG4 with time

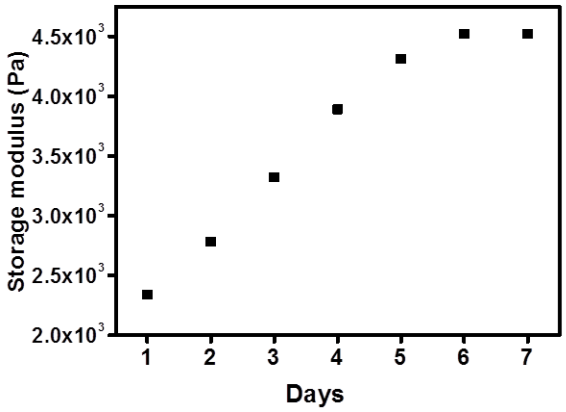


Fig. S11: The time dependent IR spectra of FLAG4

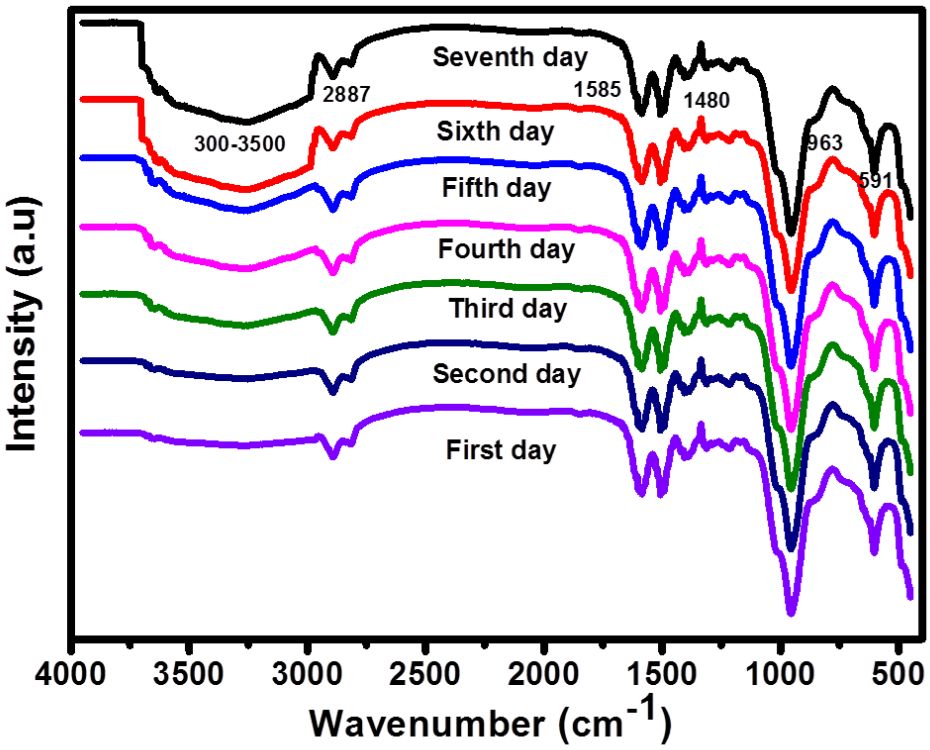


Fig. S12: Cycling performance of FLAG4 for 100 cycles at a current density of 0.1 A g^{-1}.

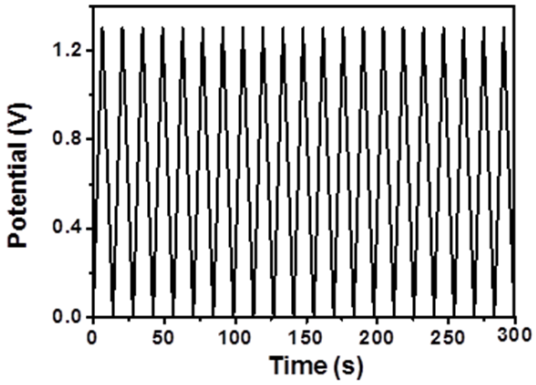


Table S2: Comparative Study of specific capacitance of Polymer and organic based gel electrolytes

S. I NO:	Gel Electrolyte	Specific Capacitance	Reference
1	PDDP/LiCl electrolyte	300.8 F/cm^{-3}	52
2	PVA/KOH gel electrolyte	0.03 mF/cm^2	53
3	PySH/PVA-H_2SO_4	507.02 mF/cm^2	54
5	FLAG	1856 mF/g	Present Work

Experimental: Procedure for the estimation of hydroxyl value

Hydroxyl number is the milligrams of potassium hydroxide equivalent to the hydroxyl content of 1 g of material. w g(~ 0.5g) of the substance was taken in a dry and pure stoppered conical flask. To this 20 ml of acetylating mixture (1 volume of acetic anhydride and 8 volume of pyridine) was added, shaken well and kept in a water bath. A blank was also prepared. It was kept for 5 hours under reflux. After acetylation, 50 ml of water was added and titrated to phenolphthalein with 0.5N NaOH. Blank titration (A) minus and sample titration (B) will give the amount of acetyl bound to hydroxyl group.

$$hydroxyl\ number = \frac{(A - B) * N * 56.1}{w}$$