ELECTRONIC SUPPLEMENTARY INFORMATION

Studies on the structure-property relationship of sodium alginate based thixotropic hydrogels

Dharmesh R. Chejara[a,b], Stalin Kondaveeti[a], Kamalesh Prasad[a,b]* and A. K. Siddhanta[a,b]*

[a]*Marine Biotechnology and Ecology Discipline,*
CSIR-Central Salt & Marine Chemicals Research Institute
G. B Marg, Bhavnagar-364002 (Gujarat), India.

[b]*Academy of Scientific & Innovative Research, Anusandhan Bhavan,*
2 Rafi Marg, New Delhi-110001, India

**E-mail:kamlesh@csmcri.org / aks@csmcri.org;*
Fax: +91-278- 2567562, Tel: +91-278-2567760

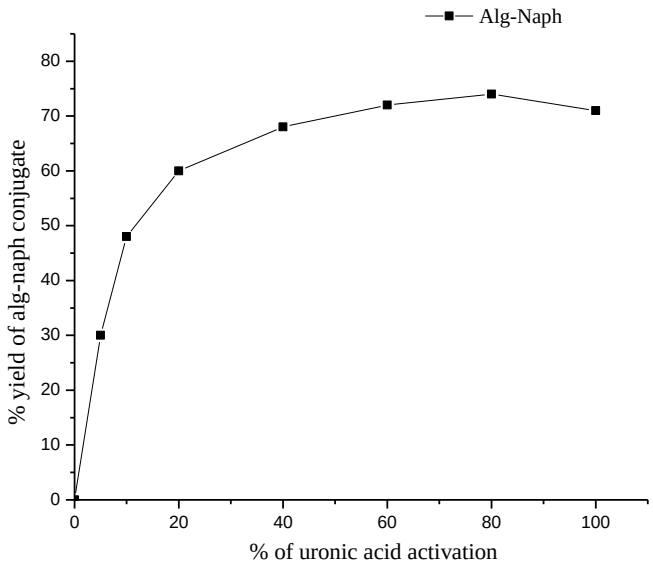

Fig. S1 Variation of the theoretical uronic acid activation by altering the concentration of EDC/NHS added to the reaction medium

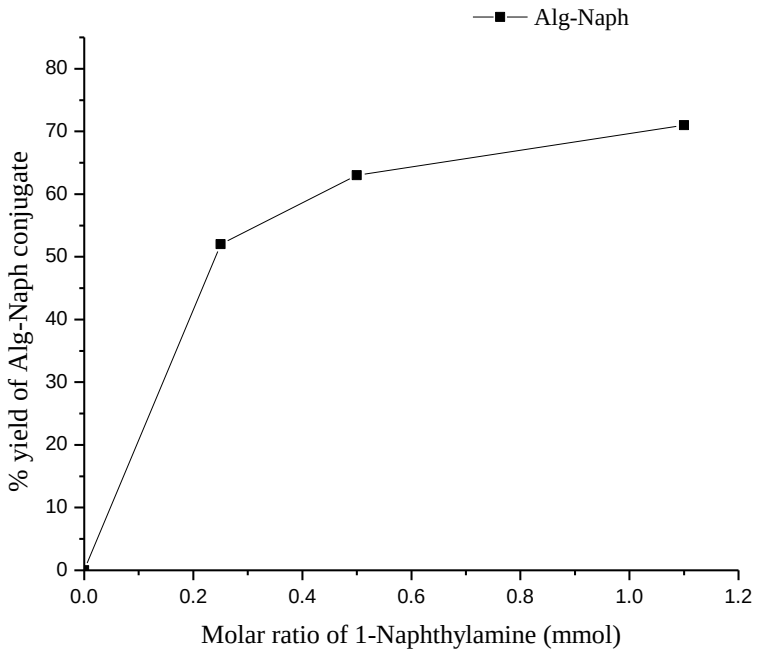

Fig. S2 Effect of molar concentration of 1-Naphthylamine on the yield of Alg-Naph conjugate

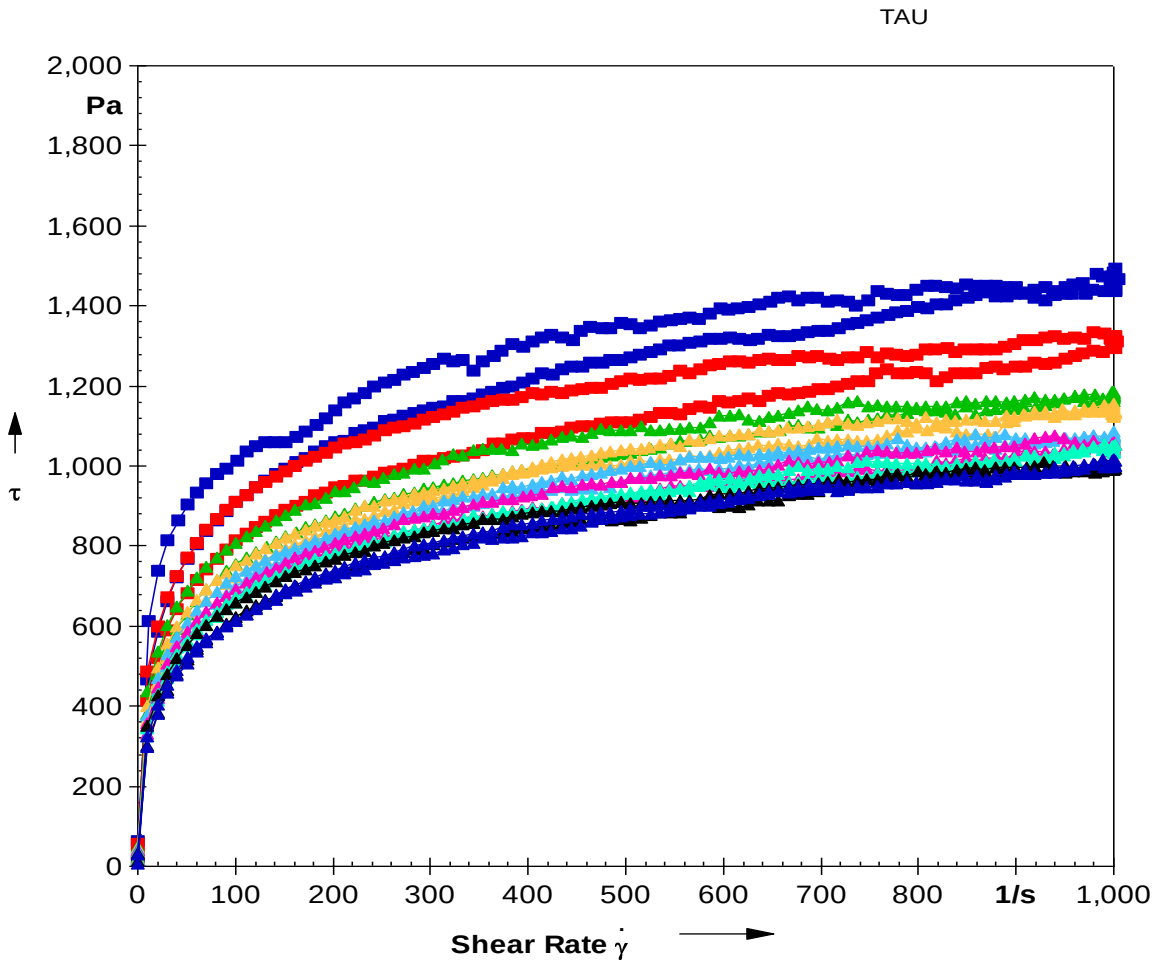

Fig. S3. Thixotropic loops for Na-Alg-Naph for 09 subsequent cycles.

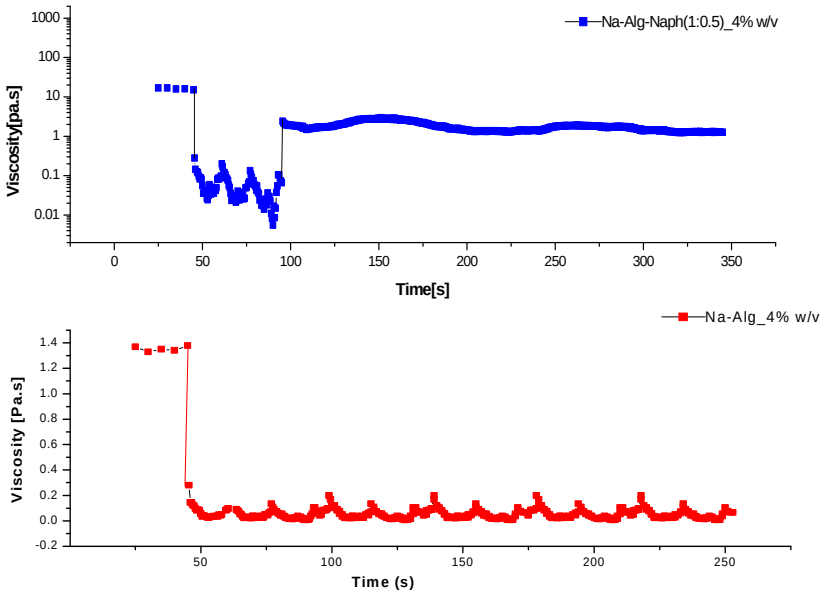

Fig. S4. Time dependent thixotropicity of Na-Alg-Naph and Na-Alginate at 4 % w/v concentration, change in viscosity with the time at different shear rate

Table S5. Viscosity data of Na-Alg, Na-Alg-Aniline, Na-Alg- Naph & Na-Alg-Anthracene amide derivatives

Sample	Apparent viscosity in (Pa.s) at conc. (2% w/v)
Na-Alg	0.09± 0.05 [a]
Na-Alg-Aniline amide	0.004± 0.05 [a]
Na-Alg-Naph amide (1:0.5)	0.37± 0.05 [a]
Na-Alg-Anthracene amide	0.024± 0.05 [a]

[a]Apparent viscosity measured at 20 RPM and at room temperature

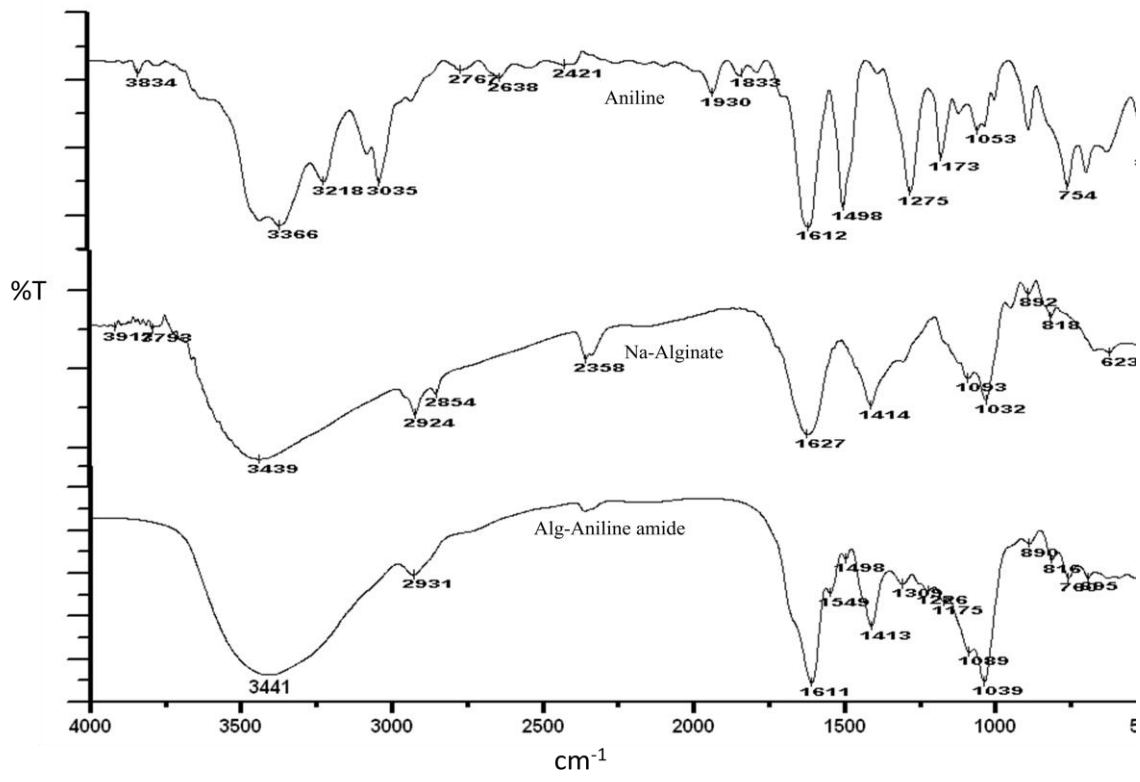

Fig. S6 FT-IR spectra of Na-alginate, aniline and alg-aniline amide derivative

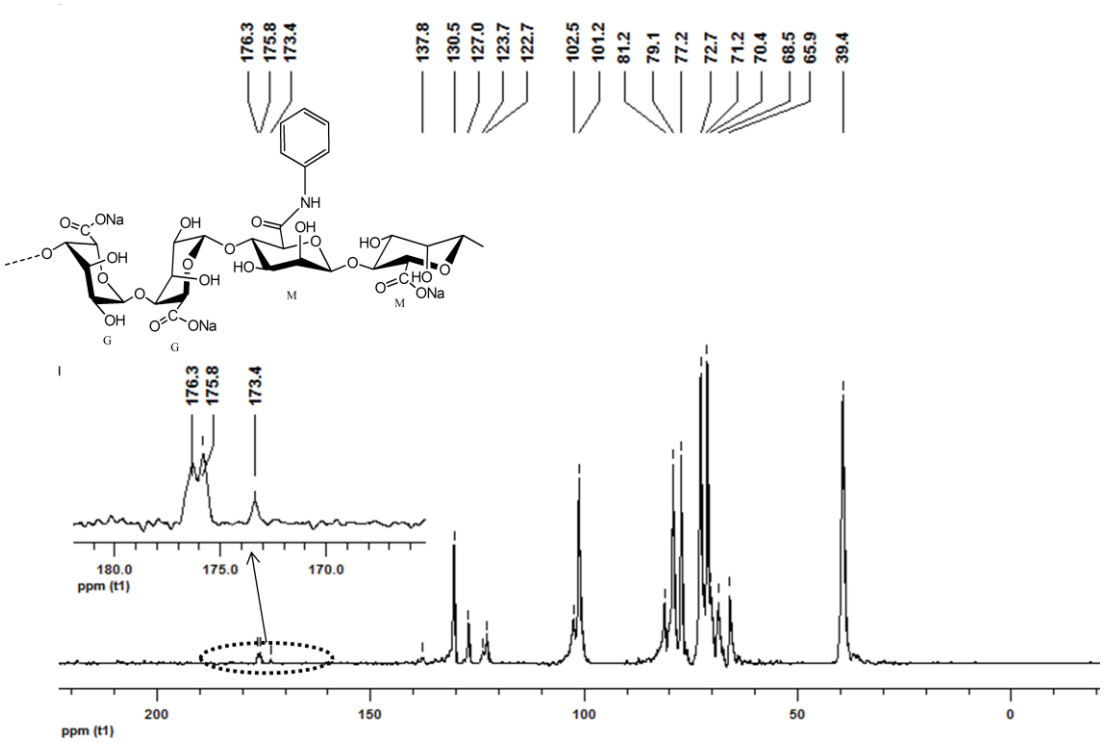

Fig.S7 ^{13}C NMR spectra of Alg-Aniline amide derivative

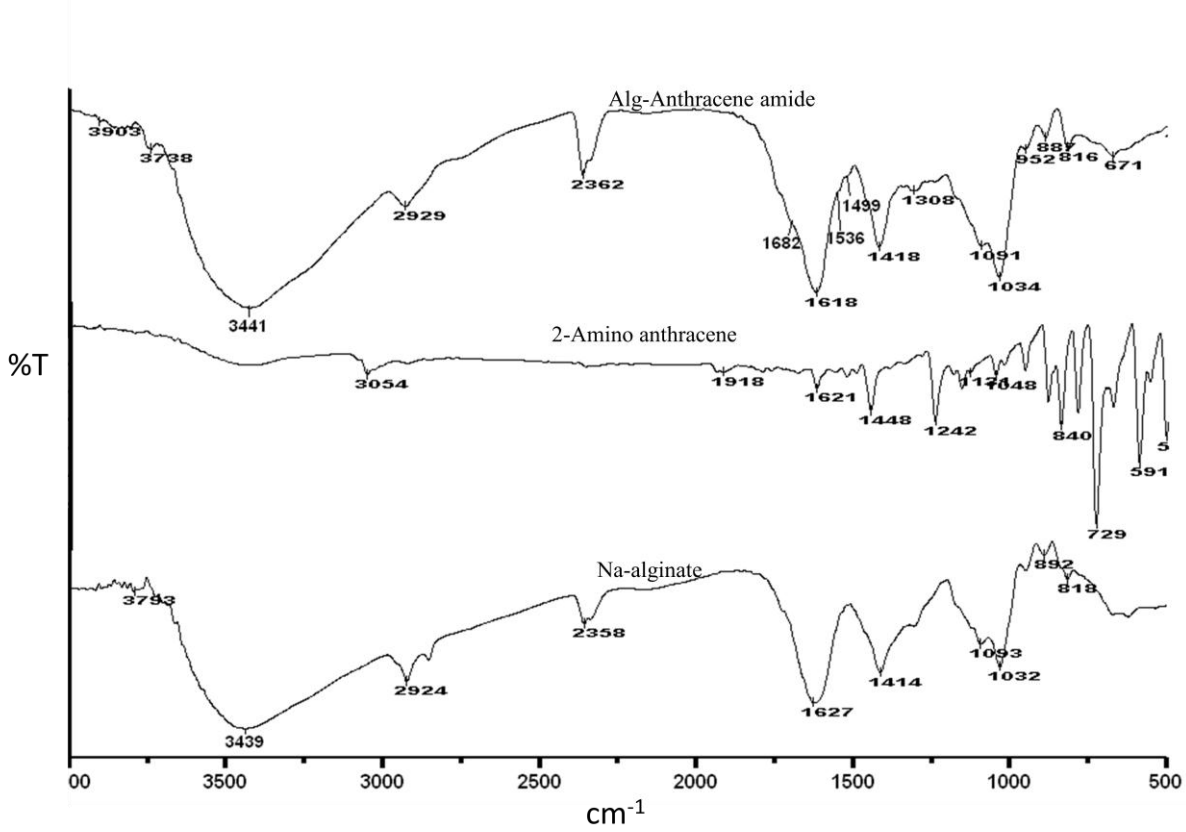

Fig.S8 FT-IR spectra of Na-alginate, 2-Amino anthracene and alg-anthracene amide

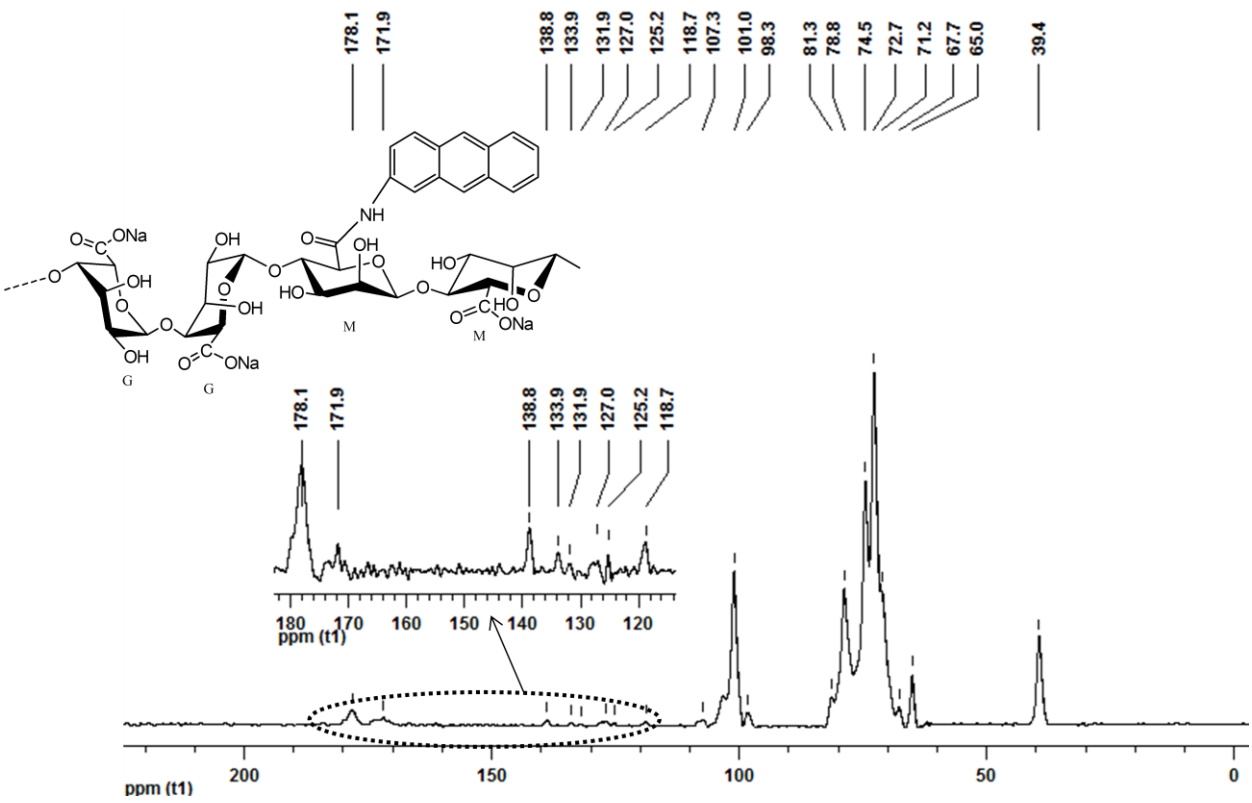

Fig.S9 ^{13}C NMR spectra of Alg-Anthracene amide derivative

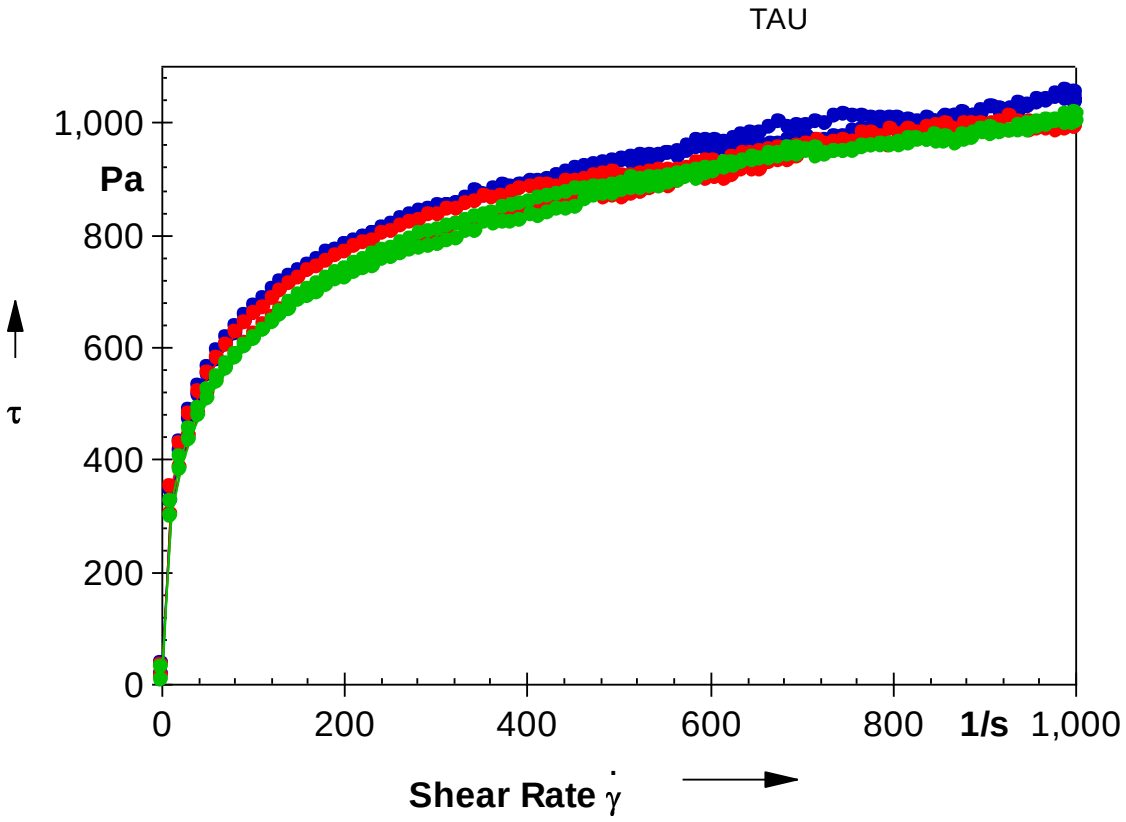

Fig.S10 Thixotropic loops for Na-Alg-Anthracene amide for 03 subsequent cycles.

Creep recovery measurements

Fig. S5 provides a diagram of the output response from a creep and recovery experiment which is the compliance (J) as a function of time and the compliance of the sample is initially overcome by the elastic component, followed by the viscoelastic component, then finally the viscous component where continuous flow occurs. In the recovery experiment, the extent of the recovery gives an indication of the thixotropic property of the samples Alg-Naph. The extent of recovery (R%) was calculated using equation No (SE1) was described by (ez-Sales et al. 2007 and Phair et al. 2009).[1, 2]

$$R\ (\%) = [J_e/J_{max}] \times 100 \ldots\ldots\ldots\ldots\ldots\ldots \text{(SE1)}$$

Where, J_e is the elastic recoverable compliance which is the difference between the compliance at the end of the creep ($t = t_2$) and recovery experiment ($t = t_3$) (Fig. S5).

A characteristic relaxation time (t_r) may also yield a quantitative assessment of the thixotropy and which was calculated using equation No (SE2).[2]

$$t_r = \eta_0 \times J_e \ldots\ldots\ldots\ldots\ldots\ldots \text{(SE2)}$$

Where, η_0 is the zero shear viscosity which was determined by the slope of the line of the viscous regime of the creep curve.

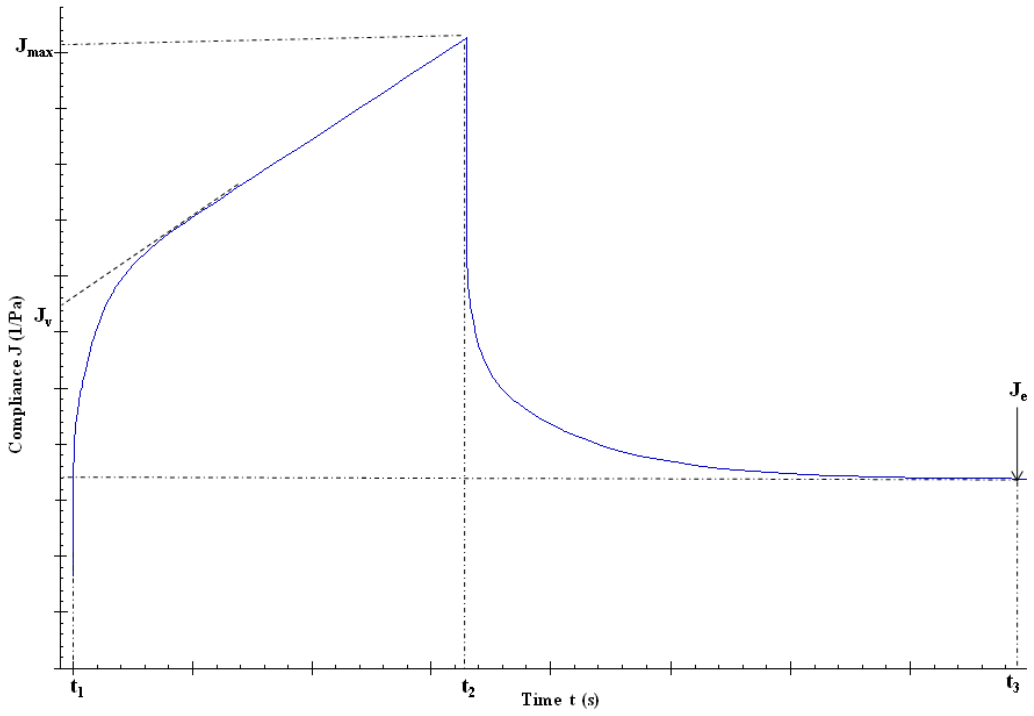

Fig. S11 Visual discription of creep and recovery

References

1) O. ez-Sales, M. Dolz, M. J. Hernandez, A. Casanovas and M. Herraez, *J. Appl. Polym. Sci.*, 2007, **105**, 2121–2128.

2) J. W. Phair, M. Lundberg and A. Kaiser, *Rheol. Acta*, 2009, **48**, 121-133