

SUPPLEMENTARY INFORMATION

Absorbance measurements:

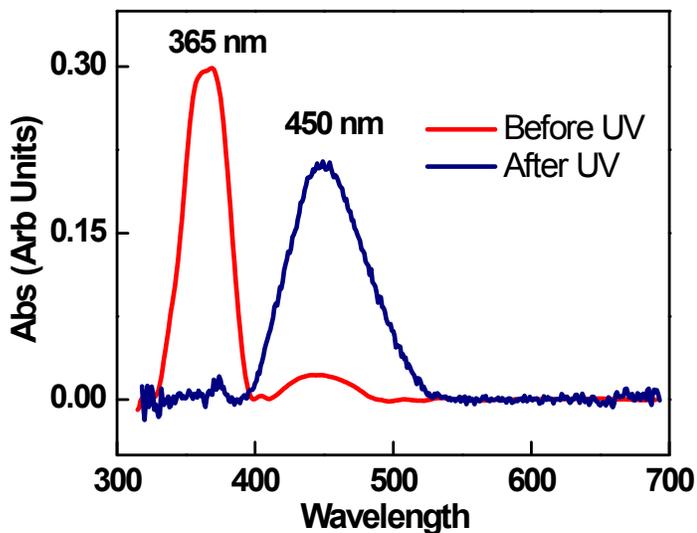


Figure S-1: UV- Visible absorption spectrum of the 5%EPH doped in the host Gel (HG) mixture before and after shining UV radiation (5 mW/cm^2) exhibiting the peaks corresponding to $\pi - \pi^*$ (365 nm) and $n - \pi^*$ (450 nm) transitions at room temperature

Dielectric measurements of 10%EPH in NLC:

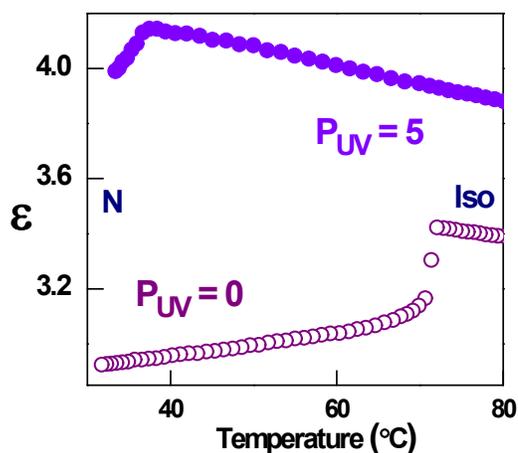


Figure S-2: Temperature dependence of ϵ for the 10% of EPH in NLC sample (without the gelator) in the absence ($P_{UV}=0$) and presence of UV ($P_{UV}=5$) irradiation.

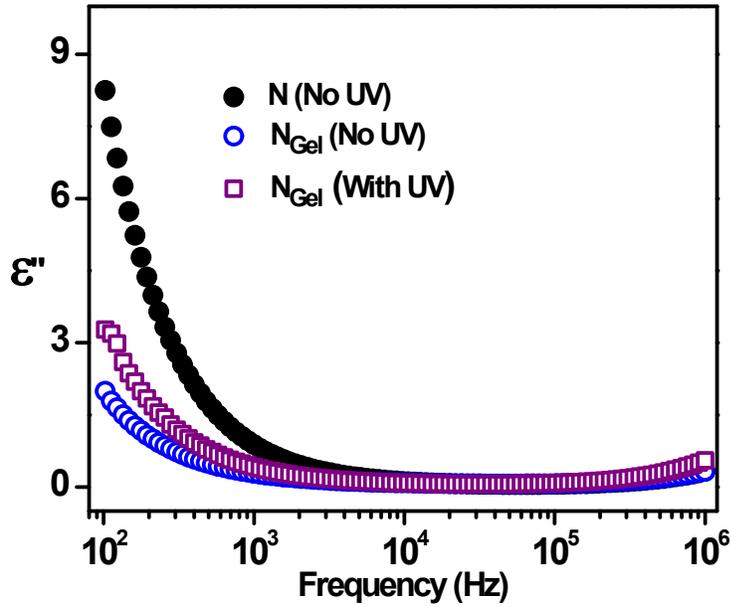
Dielectric relaxation measurements of AG:

Figure S-3: Frequency dependence of ϵ'' in the pristine nematic, N (filled circles), nematic gel, N_{Gel} (open circles) and UV illuminated ($P_{UV} = 0.2$) N_{Gel} (filled squares) phases. The variations seen at the low and high frequency ends correspond to, respectively, contributions due to the ionic content and cell relaxation.

Oscillatory rheological measurements:

In order to study the effect of UV power on gel strength, dynamic photo-rheological measurements were carried out. A sinusoidal shear with a fixed strain amplitude and angular frequency was applied to the sample. Under such conditions, G' is the storage modulus which is a measure of the energy stored in the system and G'' is the loss modulus which is an indication of the energy dissipated by the system^{S1}. These two parameters are commonly referred to as the visco-elastic moduli and the relationship between them defines the dynamic rheological characteristics of the system under study. During the experiments, before each scan, the sample was heated to the isotropic and subsequently cooled at 3°C /min upto 30 °C. Afterwards, the sample was allowed to stabilize for ~ 5 min and the measurements were done. This way we could ensure that the sample response is not affected by the strain deformations of the preceding measurements.

The oscillatory strain (γ) and angular frequency (ω) dependence of the storage modulus (G') and loss modulus (G'') for the no UV and with UV ($P_{UV} = 0.2$) scenarios of the AG system is given in Figure S3. In both the cases, features observed from the data clearly bring out gel characteristics.

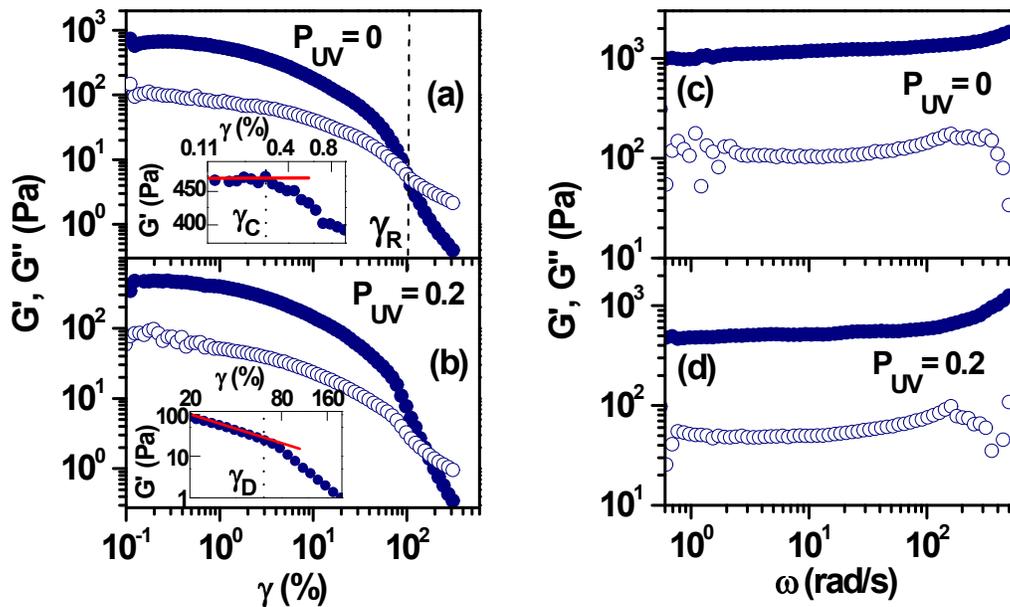


Figure S-4: Strain (left panel) and angular frequency (right panel) dependence of the visco - elastic moduli of G' (filled circles) and G'' (open circles) for AG system with $P_{UV} = 0$ and 0.2. Insets of (a) and (b) illustrate the determination of γ_C and γ_D for a representative case of the pristine sample.

Strain dependence:

The oscillatory strain is varied by fixing the angular frequency (ω) at 1 rad/s (see left panel of Figure S3). Both the visco-elastic moduli G' and G'' are strain (γ) independent upto a critical strain (γ_C), and in this strain range defined as the linear visco-elastic regime (LVR), $G' > G''$, a feature seen for gel formation. The value of G' in the linear visco-elastic regime (LVR) is a measure of the gel strength^{S1}. Beyond γ_C , the visco-elastic behaviour becomes non-linear and the solid-like (elastic) behaviour ($G' > G''$) becomes liquid-like (viscous) ($G'' > G'$) at a cross-over strain (γ_R) (see Figure S3a). For both the cases $P_{UV} = 0$ and 0.2, in the non – linear response regime beyond a strain amplitude (γ_D) there is a sharper decrease in G' which finally leads to the cross-over of G' and G'' . γ_C and γ_D (of the UV irradiated case for instance) are represented in the insets of Figure S3a and S3b respectively. The different parameters extracted from the data are given in Table S1.

	No UV	With UV
G' in LVR (Pa)	~ 675	~ 475
γ_C (%)	0.35	0.28
γ_D (%)	48.76	61.25
γ_R (%)	98.5	164.3

Table S-1: Rheological parameters extracted from the strain dependent dynamic rheological measurements

The phenomenon of the G' decreasing in two steps, which is also reported in biopolymer gels^{S2} and Xanthum gum solutions^{S3} indicates that the gel softens and flows over the strain range between γ_D and γ_R before attaining viscous behavior, instead of breaking down abruptly. It is worthwhile to note that this softening strain range is enhanced by ~ 50%

for the UV illuminated case. Also, a decrease in the G' value in LVR (see Table S1) proves beyond doubt that the gel strength is decreased upon UV irradiation.

Frequency dependence:

The angular frequency dependence of G' and G'' , with the strain value being kept constant in the LVR, is given in the right panel of Figure S3. For both the pristine and UV irradiated cases $G' > G''$ in the entire range of frequencies studied, indicating typical gel characteristics. G' value starts deviating from frequency-independent behavior at ~ 250 rad/s and ~ 130 rad/s for the pristine and UV irradiated cases respectively. Beyond these values a linear dependence on angular frequency^{S4} is seen. The onset of this linear behavior at a lower frequency in the photo-isomerized system implies a decrease in gel strength, which is also evident from the reduction in the magnitude of G' in its frequency independent regime.

Collectively, the dynamic rheological results clearly indicate a weakening of gel strength upon photo-isomerisation.

REFERENCES (SI)

- S1. H. A. Barnes, J. F. Hutton and K. Walters, *An Introduction to Rheology*, Elsevier, Amsterdam, 1989
- S2. S. B. Ross-Murphy, *J. Rheol.*, 1995, **39**, 1451-1463
- S3. K. W. Song, H. Y. Kuk and G. S. Chang, *Korea-Australia Rheology Journal*, 2006, **18**, 67-81
- S4. S. B. Ross-Murphy in *Physical techniques for the study of food biopolymers*, ed. S. B. Ross-Murphy, Springer Science+Business Media, Dordrecht, 1994, Ch 7, Pg: 344 – 392