Supplementary Material

Frequency dependence: For completeness, we display data on the frequency sweep of a typical pure gel (10 wt% SEBS in paraffin oil) and composites (10 wt% SEBS in paraffin oil, 11 vol% magnetic particles with the strings perpendicular to the plane of the sample) in the presence and absence of external field, in Figure 10. Under the same dynamic stain amplitude of 0.2%, the frequency dependence of the shear modulus is measured. The result shows that the exciting frequency has little influence on the rheological properties. Neither for the pure gel nor for the off-state or on-state (635mT) magneto-composites.

Two noteworthy features of Figure 11 support the identification of these triblock copolymer/oil blends as thermoplastic elastomer gels, namely the fact that G' consistently exceeds G" over the entire frequency spectrum for all compositions, and G' is virtually independent of frequency over three orders of magnitude.

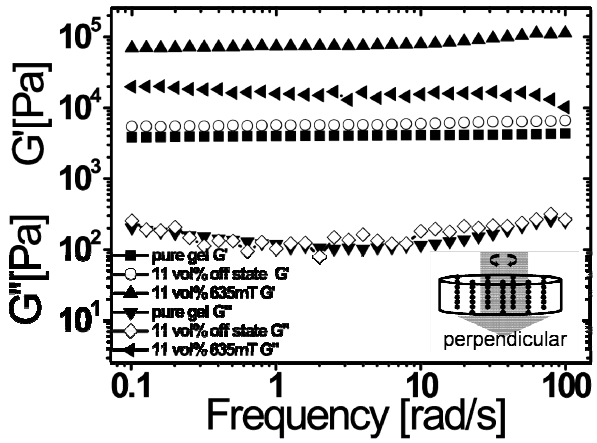

Fig. 11 Storage and loss moduli as a function of frequency measured in presence and absence of magnetic field. Magnetic particle ordering perpendicular to the plane of the gel disc and particle volume fraction =11 vol%.

Reversible re-arrangement: The time response of the absolute magneto-induced moduli difference $\Delta G'=G'-G_0'$ and $\Delta G''=G''-G_0''$ in response to stepwise magnetic field for MR Gels with parallel geometries (10 wt% SEBS in paraffin oil, 17 vol% magnetic particles) is displayed in Figure 12. Particles are aligned in the parallel direction with respect to the plane of the sample disc. The curve was constructed in the same manner as in figure 9, namely, with driving frequency fixed to 1 rad/s, and a dynamic strain amplitude set to 0.2%. The time-response of the first stepwise magnetic field (650mT) shows a remarkable time-dependent increase, that seems to be related to a particle re-arrangement process. After shut down of the magnetic field for 30 mins, the experiment was repeated again where superimposing curves are observed. This result suggests that re-arrangements of the particles is reversible. Figure 13 displays data for a control experiment with same sample in same conditions but in absence of magnetic field where practically no increase in G' is observed.

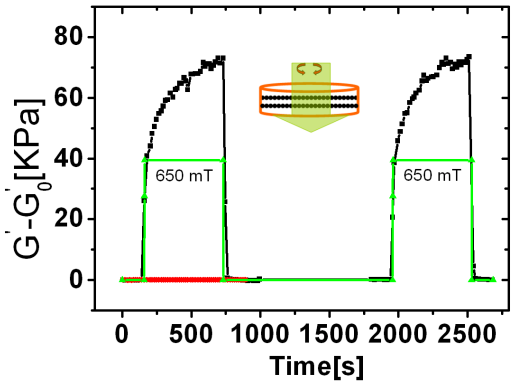

Fig. 12 Time dependence of the absolute magneto-induced moduli difference, $\Delta G'=G'-G_0'$ (black) and $\Delta G''=G''-G_0''$ (red), in response to stepwise magnetic field for the parallel sample geometry (particle volume fraction =17 vol%). Magnetic pulses are separated by 30 minutes.

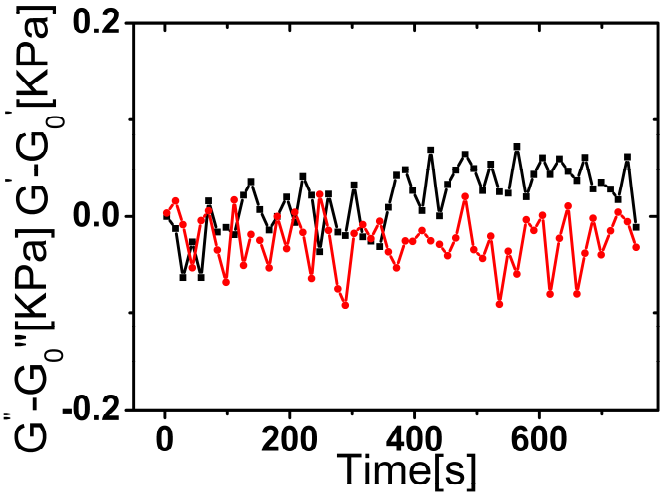

Fig. 13 Time dependence of the absolute increase in elastic and storage moduli, $\Delta G'=G'-G_0'$ (black) and $\Delta G''=G''-G_0''$ (red), with time in the absence of magnetic field. Shear strain amplitude was 0.2% at 1 rad/second. Magnetic strings are aligned parallel to the disc sample face and particle volume fraction was set to 17 vol%.