Supplementary Information

Table S1. Fitting parameters for the data in the manuscript

Data	**Function**	**Fitting parameters ([ ]: Units)**	**Parameter values**
Stress relaxation of nanoparticle-polymer gel (Fig. 4A)	Stretched exponential function (Equation 9)	$\{G_0[Pa], \tau_c\ [s], \alpha\}$	$\{1.05, 3.91 \times 10^3, 0.31\}$
Dynamic modulus of metal-coordinating polymer networks (Fig. 4C)	Log-normal $H(\tau)$ function (Equation 17)	$\{G_0[Pa], \tau_c\ [s], \sigma_w\}$	$\{3.54 \times 10^4, 8.84 \times 10^{-5}, 4.47\}$
Dynamic modulus of critical mucin gels (Fig. 6A)	Spring-pot (Table 1)	$\{\mathbb{V}\ [Pa\ s^\alpha], \alpha\}$	$\{0.41, 0.39\}$
Dynamic modulus of silica colloidal gels (Fig. 6B)	Fractional Maxwell gel (Table 1)	$\{G\ [Pa], \mathbb{V}\ [Pa\ s^\alpha], \alpha\}$	$\{2.76 \times 10^3, 8.84 \times 10^4, 0.36\}$
Dynamic modulus of polyelectrolyte complexes (Fig. 6C)	Fractional Maxwell liquid (Table 1)	$\{\eta\ [Pa\ s], \mathbb{G}\ [Pa\ s^\beta], \beta\}$	$\{25.45, 744.10, 0.35\}$
Stress relaxation of fish muscle tissue (Fig. 6D)	Fractional Maxwell model (Table 1)	$\{\mathbb{V}\ [Pa\ s^\alpha], \mathbb{G}\ [Pa\ s^\beta], \alpha, \beta\}$	$\{8.75 \times 10^5, 2.21 \times 10^4, 0.68, 0.11\}$

Demonstration of MATLAB codes for fitting rheological data

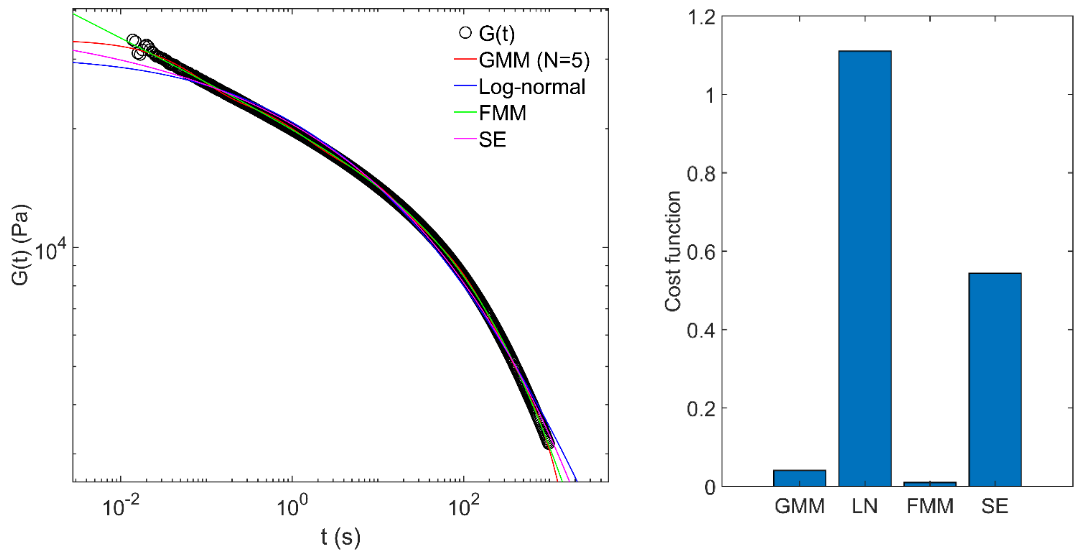

Figure S1. Fit results for $G(t)$ data from measurements on yellowfish tuna myotome. (Left) Fit results to the data. (Right) Cost function computed from the weighted residual sum of squares. See attached MATLAB demo for details on the fitting procedures.

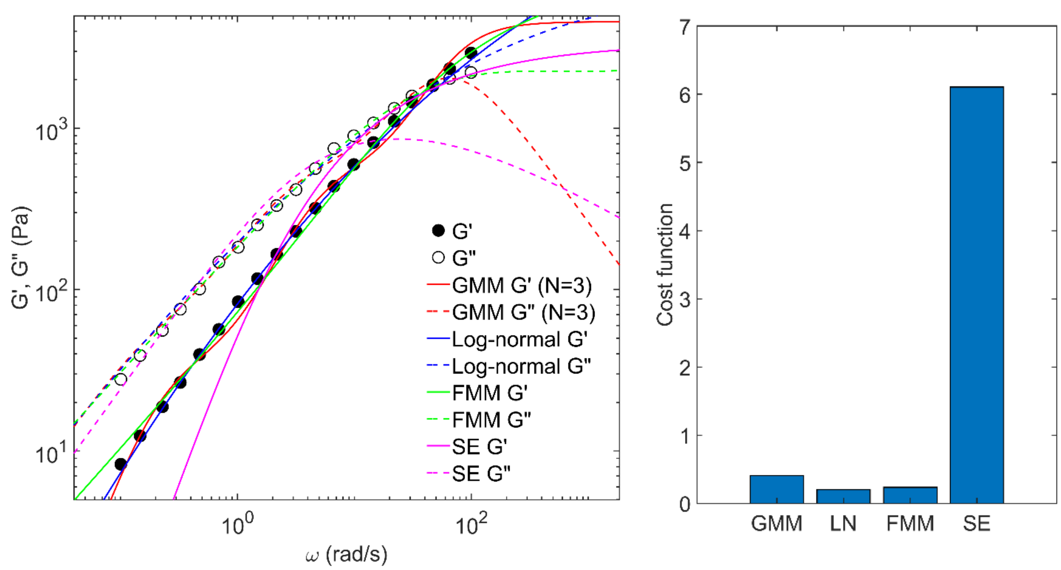

Figure S2. Fit results for the $G'(\omega)$ and $G''(\omega)$ data of Epstein et al. (Left) Fit results to the data of Epstein et al. (see Fig. 4C in the main text), (Right) Cost function computed from the weighted residual sum of squares. See attached MATLAB demo for details on the fitting procedures.