

From lecture 11, slide 5, the parameters obtained by fitting the Maxwell-Weichert Model to the results of the stress relaxation experiment for the four Alginate Hydrogels are the following:

A table with numbers and a number of objects

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The 35 kDa hydrogel is the smaller molecular weight hydrogel and the model parameters are:

* Tau1 = 81
* E1 = 0.5
* Tau2: 900
* E2 = 0.5

Slide 4, lecture 11, gives the equations of the components of the harmonic modulus G:

G = G’ + i G’’

Where

* G’ = E1 \* (Tau12  w2 / (1+ Tau12 w2 )) + E2 \* (Tau22  w2 / (1+ Tau22 w2 ))
* G’’ = E1 \* (Tau1 w/ (1+ Tau12 w2 )) + E2 \* (Tau2 w/ (1+ Tau22 w2 ))

Using these equations for 0 < w < 1kHz, we obtain the following plot:

A graph of storage modulus and a comparison of hydrogel

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* G’, storage modulus, increases slowly to reach a plateau at 1, indicating that the hydrogel preserves energy well and the elastic component is constant across the low-frequency range.
* G’’, loss modulus, decreases rapidly, from 0.07 to almost 0, indicating the viscous component dissipates quickly as frequency increases.

As low-frequency G’ and G’’ are close, the hydrogel shows more viscous behavior and as frequency increases, G’ dominates thus the hydrogel behaves more elastically (stress relaxation is slower).