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Electronic Supplementary Information: **Tailoring the material properties of gelatin hydrogels by high energy electron irradiation**

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Effect of concentration on the relationship between the loss and storage moduli

Using gelatin of various concentrations (2 to 10 wt.), the relationship between the increase in the loss and storage moduli can be observed in Figure 1. The rate of increase between both the storage and loss moduli are comparable, as increasing the gelatin concentration results in a proportional increase in the helical and random coil content, if gels are prepared under similar conditions.[1] The loss modulus represents parts of the gelatin structure that dissipate energy by friction, and has been shown to increase with gelatin concentration as more dangling ends and loose ends are formed.[1]

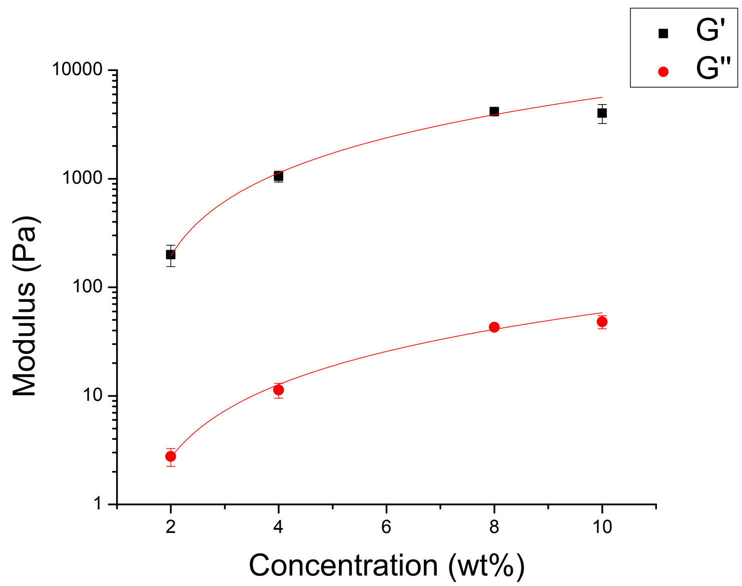

Figure 1: Relationship between the storage (G') and loss modulus (G''), with power fits increasing to the power of 2.0 ± 0.2 and 1.9 ± 0.2, respectively.

Effectiveness of electron irradiation on the loss moduli at various concentrations

The effectiveness of electron irradiation on the loss modulus was also observed for a range of gelatin concentrations, as shown in Figure 2. In general, the loss modulus increases with irradiation dose for each concentration of gelatin. However, since the measurements were not tuned to minimize noise, the trends are not as clearly observed as for the storage moduli. However, it can be seen in Figure 3, with respect to the initial loss modulus values, electron irradiation has the most effective increase on lower concentrations of gelatin.

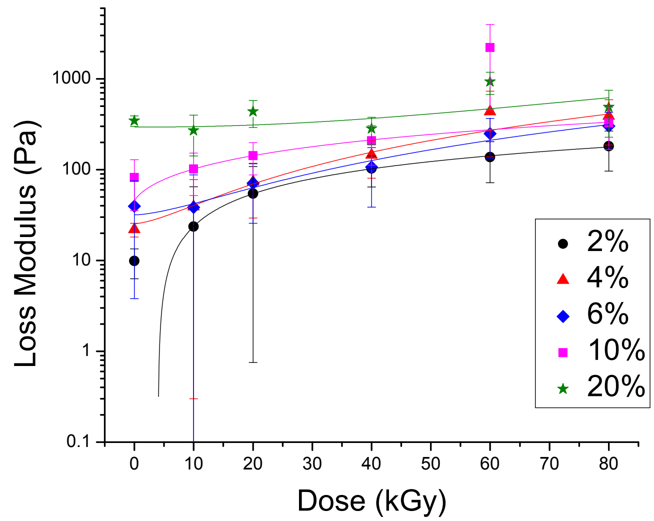

Figure 2: The loss moduli of various wt% concentrations of gelatin, with respect to increasing electron dose. The data is fitted with power law fits.

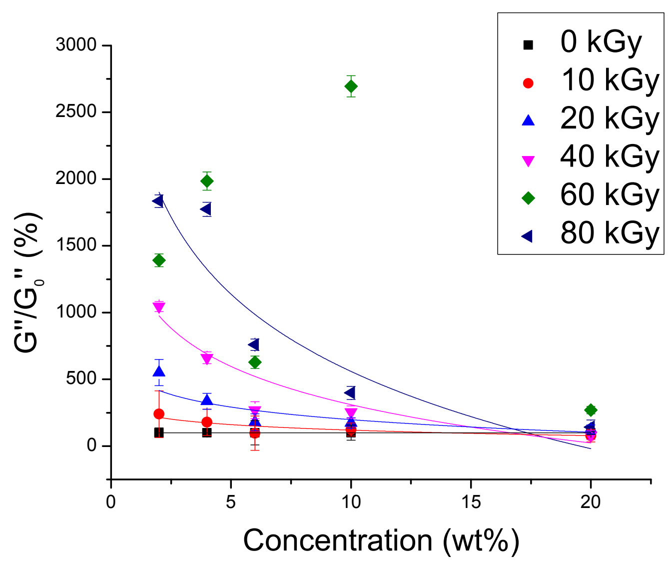

Figure 3: Relationship between concentration and the effective increase in the loss modulus (G") with respect to the initial value (G_0"), for various doses. The data is fitted with exponential fits, except for the 60 kGy set which did not converge.

Table 1 Calculated values for M_c, using rubber elasticity (RE) and Flory-Rehner (FR)

	4%		6%		10%	
Dose	RE	FR	RE	FR	RE	FR
kGy	10^3 g/mol	10^3 g/mol	10^3 g/mol	10^3 g/mol	10^3 g/mol	10^3 g/mol
0	41 ± 4	26 ± 3	39 ± 3	22 ± 2	36 ± 3	16 ± 1
10	35 ± 4	16 ± 0.4	34 ± 4	11 ± 0.2	30 ± 3	7.3 ± 0.2
20	30 ± 2	12 ± 0.1	30 ± 2	8.2 ± 0.4	28 ± 3	4.3 ± 0.7
40	29 ± 3	8.2 ± 0.1	27 ± 4	5.7 ± 0.4	26 ± 6	3.4 ± 0.1
60	28 ± 3	4.8 ± 0.2	27 ± 2	4.2 ± 0.1	27 ± 4	2.6 ± 0.1
80	28 ± 3	3.3 ± 0.1	27 ± 6	2.8 ± 0.1	25 ± 1	2.0 ± 0.1

Table 2 Calculated mesh sizes ξ, using rubber elasticity (RE) and Flory-Rehner (FR)

	4%		6%		10%	
Dose	RE	FR	RE	FR	RE	FR
kGy	nm	nm	nm	nm	nm	nm
0	62 ± 9	49 ± 8	56 ± 9	42 ± 10	46 ± 5	31 ± 3
10	50 ± 6	34 ± 1	45 ± 6	25 ± 0.6	38 ± 4	19 ± 0.6
20	44 ± 4	28 ± 0.3	40 ± 4	21 ± 1	34 ± 6	13 ± 2
40	40 ± 5	21 ± 0.6	35 ± 6	16 ± 1	31 ± 7	11 ± 0.2
60	35 ± 5	14 ± 1	33 ± 3	13 ± 0.3	30 ± 5	10 ± 0.2
80	33 ± 4	11 ± 0.4	31 ± 7	10 ± 0.6	28 ± 2	8 ± 0.3

[1] C. Joly-Duhamel, D. Hellio, A. Ajdari and M. Djabourov, Langmuir, 2002, 18, 7158–7166.