Supporting information for “Monitoring the photocrosslinking kinetics of gelatin methacryloyl using in situ photorheology” by CD O’Connell et. al.

1. Measurement of I2959 molar extinction coefficient in DPBS

![Graph showing absorption of 365 nm light as a function of I2959 concentration.](image)

Figure S1: Absorption of 365 nm light as a function of I2959 concentration. Molar extinction coefficient was measured at 2.46 +/- 0.035 M^{-1} (R^2=0.998)

2. Photo-initiator degradation model
3. Justification of rheological measurements as a proxy for hydrogel crosslinking

According to the theory of polymer elasticity the elastic modulus \((E)\) of a rubber-like material is directly proportional to the crosslink density, \(V_c\):\(^1\)

\[
E = \frac{(3\rho RT)}{M_c} = \frac{(3\rho RT)}{V_c} \quad (6)
\]

where, \(R\) is the gas constant, \(T\) is absolute temperature, \(\rho\) is polymer density, and \(M_c\) is the average molecular weight between crosslinks. For hydrogels this expression often contains a constant pre-factor denoting dilution of the network. Meanwhile the elastic modulus is related to the shear modulus \((G)\) by:

\[
E = 2G(1 + v) \quad (7)
\]

where \(v\) is Poisson’s ratio (typically 0.5 for most materials). The shear modulus is thus linear with respect to crosslink density, according to:

\[
G = \rho RT V_c \quad (8)
\]

Thus, the increase in shear modulus is directly related to the rate of crosslinking.
4. Estimated decrease in I2959 concentration with time at a range of light intensities.

Figure S3: Calculated I2959 concentration as a function of time at a range of light intensities. Most GelMa experiments were completed within 200s, during which time the GelMa concentration does not decrease by more than 10%, even for high intensities.