Supplemental

Equation 6.3 was solved numerically using an adaptive-step Runge-Kutte 4th order integration algorithm (MATLAB's ode45 built-in). The differential equation was defined as:

$$\frac{dF}{dt} + \frac{F}{t_m} = 0 \tag{S1}$$

$$H = 1 - F \tag{S2}$$

where F is a population of "flaws" that can be healed by mechanical relaxation. The lack of any other flaws or healing modes is a basis assumption of the model. Equation 3 results when S1 is integrated by parts with the initial condition of t=0, F=1. The resulting expression for F is then substituted into S2. The functional form of $\tau_m(t)$ was determined by multiplying the time dependent functions $\tau_b(t)$ and $\varepsilon(t)=p(t)-p_{gel}$ by the scaling proportionality C. Bond conversion p(t) was determined by solving the kinetic model of the Diels-Alder reaction as in previous work[7j] but incorporating the temperature dependence (and therefore time dependence) of the kinetic parameters via the interpolation of Figure 3. $\tau_b(t)=1/k_r(t)$ was calculated in this fashion as well. Initial conditions of the kinetic model were determined by assuming a post-heating temperature decay to ambient with a time constant of 1.5 minutes (the qualitative time to vitrification for a typical induction heating experiment,) solving the kinetic model for an additional 5 minutes post-heating, and assuming the final conversion remained constant due to kinetic limitations caused by physical vitrification. This resulted in initial conversions that were ~1% greater than those predicted to occur at equilibrium at healing conditions.