Supporting Information:

A general model for the kinetics of self-condensing vinyl polymerization

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1. Distribution function

Looking at the eq 11 carfully, we can fine that it has following tentative solution:

$$P_{n,m} = M_0 Q_{n,m}(1-x)x^{n+m-1}e^{-nx/\alpha} \qquad \text{(A1)}$$

Where $Q_{n,m}$ is the constant needing to be determined. Substituting eq A1 into Eq.(11) leads:

$$Q_{n,m} = \frac{n}{2\alpha(n+m-1)}\sum_{i,j} Q_{i,j}Q_{n-i,m-j} \qquad \text{(A2)}$$

It can be known from eq 11 and the initial conditions that:

$$Q_{1,0} = \alpha\,, \qquad Q_{0,1} = 1-\alpha \qquad \text{(A3)}$$

Combining eq A2 with eq A3 and taking a direct summation gives rise to

$$Q_{n,m} = \alpha\frac{n^{n+m-1}}{n!m!}\left(\frac{1-\alpha}{\alpha}\right)^m \qquad \text{(A4)}$$

In summary, the solution of eq 11 is

$$P_{n,m} = \alpha M_0 \frac{n^{n+m-1}}{n!m!}\left(\frac{1-\alpha}{\alpha}\right)^m (1-x)x^{n+m-1}e^{-nx/\alpha} \qquad \text{(A5)}$$

2. The second moment

Eq 13 can be rewritted by

$$P_i = \sum_{n=0}^{i} P_{n,i-n} = \alpha M_0 \frac{1-x}{x}\sigma^i \sum_{n=0}^{i}\frac{n^{i-1}}{n!(i-n)!}\eta^n \qquad \text{(A6)}$$

Where

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$$\sigma = \frac{1-\alpha}{\alpha}x \qquad\qquad \eta = \frac{\alpha}{1-\alpha}e^{-x/\alpha} \tag{A7}$$

Combining eq A6 with eqs 3 and 4 yields:

$$\sum_i \sigma^i \sum_{n=0}^{i} \frac{n^{i-1}}{n!(i-n)!}\eta^n = \frac{x}{\alpha} \tag{A8}$$

Therefore

$$\sum_i i^2 P_i = \alpha M_0 \frac{1-x}{x}\left(\sigma\frac{\partial}{\partial\sigma}\right)^2 \left[\sum_i \sigma^i \sum_{n=0}^{i} \frac{n^{i-1}}{n!(i-n)!}\eta^n\right]$$

$$= \alpha M_0 \frac{1-x}{x}\left(\sigma\frac{\partial}{\partial\sigma}\right)^2\left(\frac{x}{\alpha}\right) = M_0 \frac{\alpha + x^2 - \alpha x^2}{\alpha(1-x)^2} \tag{A9}$$