

Polymers

Example Sheet 2

Stepwise Polymerisation

Using the stepwise polymerisation equation,

$$N_r = N_0 P^{(r-1)} (1 - P)^2$$

1. Determine the ratio $\overline{DP}_3 / \overline{DP}_w$.
Comment on the significance of your result in relation to question 4 on example sheet 1.

ans
$$\frac{Dp_3}{Dp_2} = \frac{1 + 4p + p^2}{(1 + p)^2}$$

2. Show that the position of the maxima of the weight fraction distribution plotted as a function of r , the degree of polymerisation, is close to the value of \overline{DP}_n at high conversions.

$$r_{\max} = -\frac{1}{\ln p}$$

3. For $P = 0.95$, estimate the number and weight fraction of polymer chains with degree of polymerisation greater than 30.
(0.25, 0.55)
4. Show that the weight fraction distribution has no maximum at low conversions. (remember that at low conversions most of the distribution will be say 1,2,3,4,5,6,7,mers).
5. Tripos taster. 1999.3.1