How to calculate
Mn, Mw and Mz

from raw molecular weight data for resin PBR0

Calculations

(3) This is the data in the excel file
6) Case Fiber Spinning MWD PB Resins

(4) NOTE:
I added a column so, you can see that there are 115 chains of different sizes

i chain	Mwi	Weight fraction (Xi) of each Mi for the PBR0 resin
1	4956437	0.04
2	4630417	0.04
3	4325840	0.05
4	4041299	0.06
5	3775473	0.07
6	3527133	0.08
7	3295128	0.10
8	3078383	0.12
9	2875896	0.14
10	2686727	0.16

(1)

$$Mn = \frac{\Sigma N_i M_i}{\Sigma N_i}$$

(1)

(2) Where:

Ni is the amount of molecules of size Mi

and

Mi is the molecular weight of the ith chain and is represented by Mwi

The number of **i** chains is the one given to you on a list

$$Mw = \frac{\Sigma N_i M_i^2}{\Sigma N_i M_i}$$

(2)

$$Mw = \frac{\Sigma N_i M_i^3}{\Sigma N_i M_i^2}$$

(3)

(5) The number of moles is equal to:

$$N_i = X_i\,(grs) / Mw_i\,(grs/mol) = moles$$

(1) $$Mn = \frac{\Sigma \dfrac{X_i}{M_i} M_i}{\Sigma \dfrac{X_i}{M_i}} = \frac{\Sigma X_i}{\Sigma \dfrac{X_i}{M_i}}$$

Calculations for Mw and Mz:

$$Mw = \frac{\sum \frac{X_i}{M_i} M_i^2}{\sum \frac{X_i}{M_i} M_i} = \frac{\sum X_i M_i}{\sum X_i} \qquad \textcolor{red}{(2)}$$

$$Mz = \frac{\sum \frac{X_i}{M_i} M_i^3}{\sum \frac{X_i}{M_i} M_i^2} = \frac{\sum X_i M_i^2}{\sum X_i M_i} \qquad \textcolor{red}{(3)}$$

You have Xi and Mi for each resin, so you can now calculate de average numbers

Steps

1. Observe that Column B gives you the molecular weight for each of the 116 chains as reported by Gel Permeation Chromatography (GPC) measurements.

2. Observe that column C gives you the grams of each chain and the sum should be 100 grs (if not normalize the data so the sum is 100)

3. Go to cell C118 and make sure that the summation of the weights gives you 100

4. Do the calculation of Mn on cell C119 using equation 1 from slide 2

5. Do the calculation of Mw on cell C120 using equation 2 from slide 3

6. Do the calculation of Mz on cell C121 using equation 3 from slide 3

Hint (use the sumprodcut function)