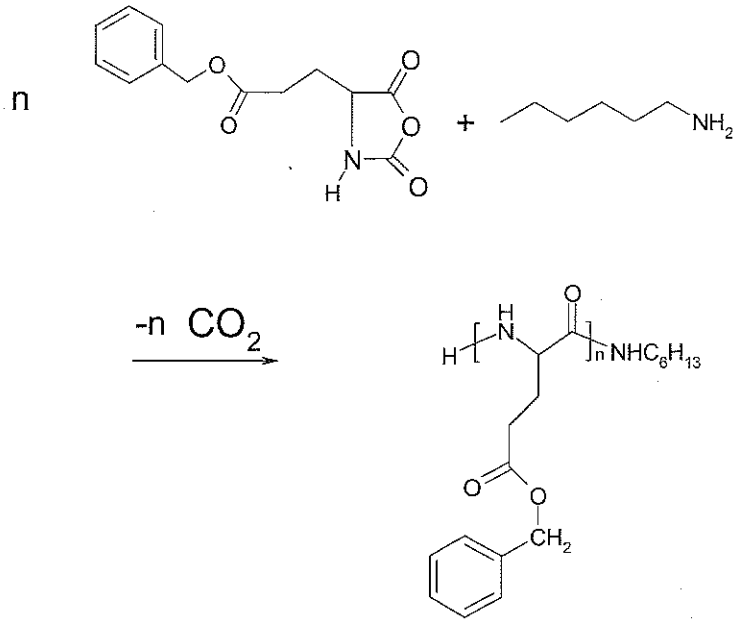
NCA_Polymerization



The reaction above shows polymerization that actually is done in the Daly, Zhang, Negulescu and Russo labs—creation of a synthetic homopolypeptide, in this case poly(benzylglutamate). Estimate the number average molecular weight, weight average molecular weight and the length (as alpha helix) of the polypeptide produced when 3.35 g of monomer is initiated by 0.0532 g of hexylamine initiator. What do you expect for M_w/M_n?

$$\overline{DP_n} = \frac{[M]}{[I]} = \frac{\left(\frac{\text{mol M}}{\text{volume}}\right)}{\left(\frac{\text{mol I}}{\text{volume}}\right)} = \frac{\text{mol M}}{\text{mol I}} = \frac{\frac{3.35\ g}{263\ g/mol}}{\frac{0.0532\ g}{101\ g/mol}} = \overline{DP_n} \text{ of } 24$$

MW of monomer is 205 $\longrightarrow$ $24 \cdot 205 = 4920$ g/mol (number average)

For weight average, plug into WB # 19 and $\overline{DP_w} = 25$ 5,125 g/mol (weight average)

$$PDI = \frac{M_w}{M_n} = \frac{5125}{4920} = 1.04$$

For the length, each monomer in α-helical form is 20 Å.

For M_n, length is 48 nm

M_w, length is 50 nm