

Biomaterials HW 4

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1. We know that for a living anionic polymerization

$$M_n = \frac{[M]_0}{[I]_0} * M_0$$

where $[M]_0$ and $[I]_0$ are the initial concentrations of

$$[Na] = 2 * 0.0033mol = 0.0066mol = 0.153g$$

To completely stop the polymerization, all the molecules of sodium have to react with water, so there must be equal mols of sodium and water.

$$0.0066mol * 18 \frac{g}{mol} = 0.12g$$

Even a small amount of water can completely terminate the reaction, so the polymerization should be conducted in a closed system with an inert gas.

2. As shown in the reaction, the polymer is a triblock where the length of the isoprene block is double the length of the styrene blocks.

We can calculate the mols of all the chemicals

$$[n - butyllithium] = 0.2mol/L * 0.008L = 0.0016mol$$

We also now that for an anionic living reaction,

$$M_n = \frac{[M]_0}{[I]_0}$$

We can then use this formula to calculate the number-average molecular weight for each block

$$M_n(styrene) = \frac{18g}{0.0016mol} = 11250$$

$$M_n(isoprene) = \frac{60g}{0.0016mol} = 37500$$

$$M_n = 2 * M_n(styrene) + 2 * M_n(isoprene) = 97500$$