

Homework 3- Solution

Question 1:

Epoxy Novolac with $n = 1$.

There are 3 epoxy groups.

The molecule has 29 C, 6 O, and 30 H .

$$29(12) + 6(16) + 30(1) = 474 \text{ g/mole.}$$

Epoxy equivalent weight: $474/3 = 158$.

TETA (Triethylene tetraamine) has $6C + 4N + 18 H = 146 \text{ g/mole.}$

There are 6 amine hydrogens.

Hydrogen equivalent weight: $146/6 = 24.3$

Stoichiometric ratio: $24.3/158 = 0.154$.

Question 2:

T = 350 K,

$K_1 = 1.872 \times 10^{-3} / \text{min}$, $K_2 = -4.86 \times 10^{-3} / \text{min}$, $K_3 = 0.98 \times 10^{-3} / \text{min}$.

Plots of rates of cure are shown in figures 1 and 3 for the two ranges of alpha.

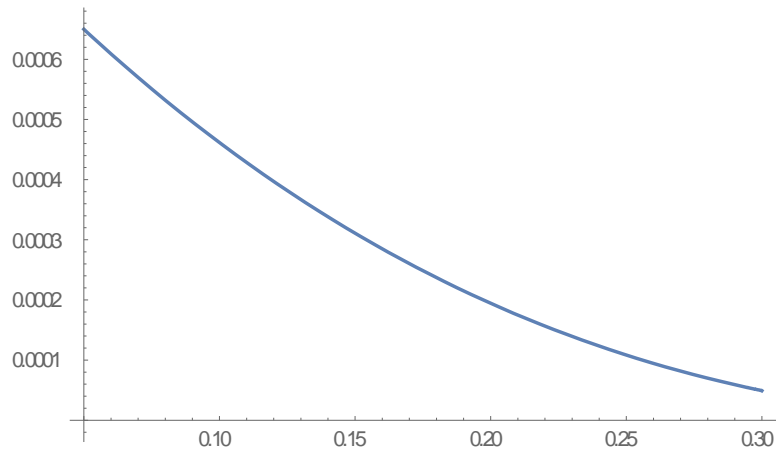


Figure 1: T = 350 K, $\alpha < 0.3$.

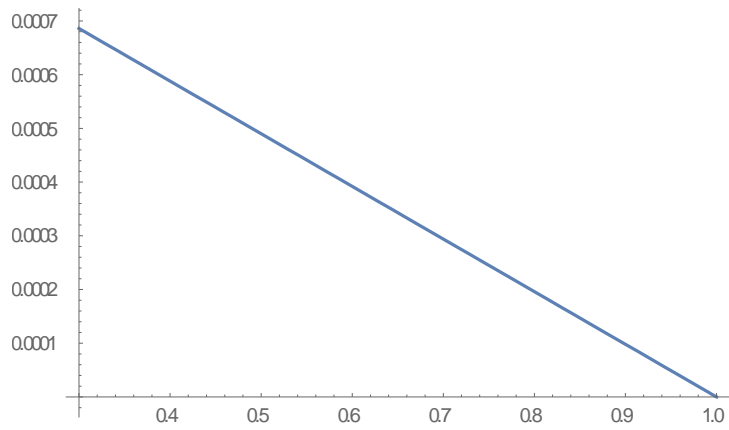


Figure 2: $T = 350 \text{ K}$, $\alpha > 0.3$.

$T = 400 \text{ K}$.

$K_1 = 0.06 \text{ /min}$, $K_2 = -0.137 \text{ /min}$, $K_3 = 0.0106 \text{ /min}$

Plots of rates of cure are shown in figures 3 and 4 for the two ranges of α .

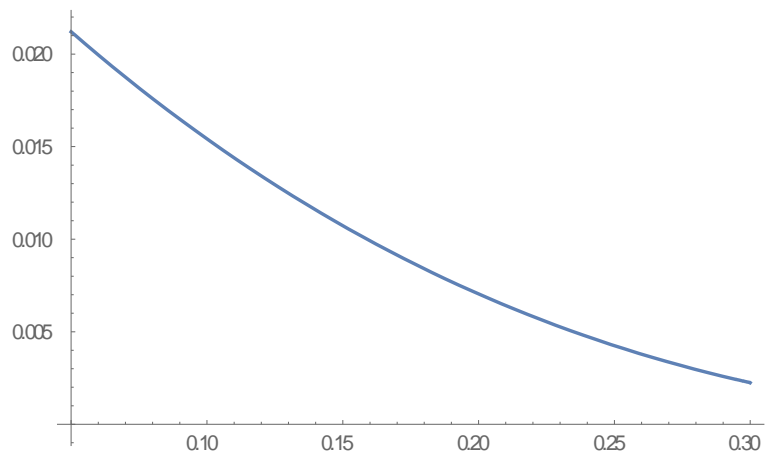


Figure 3: $T = 400 \text{ K}$, $\alpha < 0.3$.

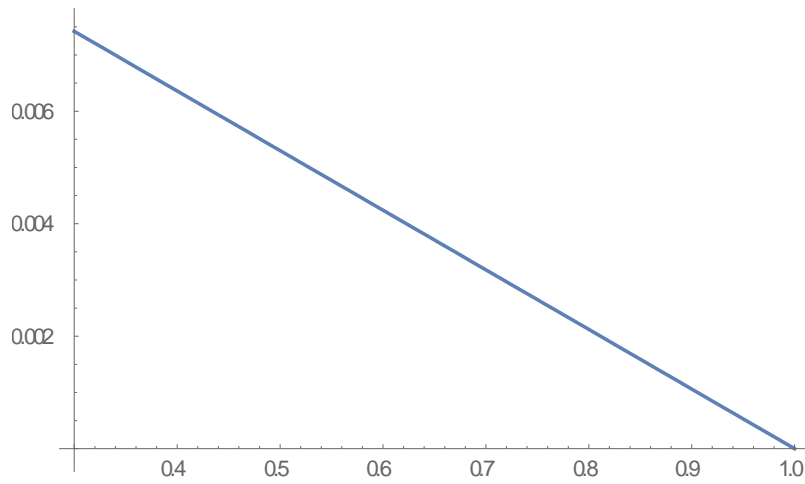


Figure 4: T = 400 K, $\alpha > 0.3$.

T = 450 K

$K_1 = 0.892$ /min, $K_2 = -1.85$ /min, $K_3 = 0.052$ /min

Plots of rates of cure are shown in figures 5 and 6 for the two ranges of α .

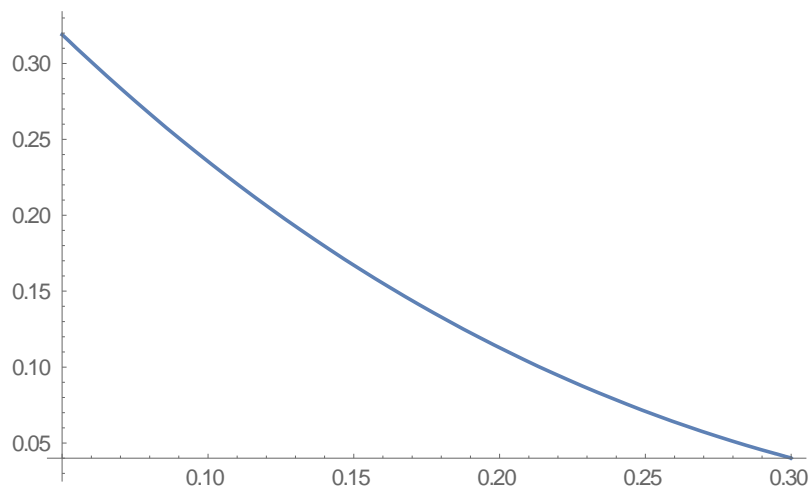


Figure 5: T = 450 K, $\alpha < 0.3$.

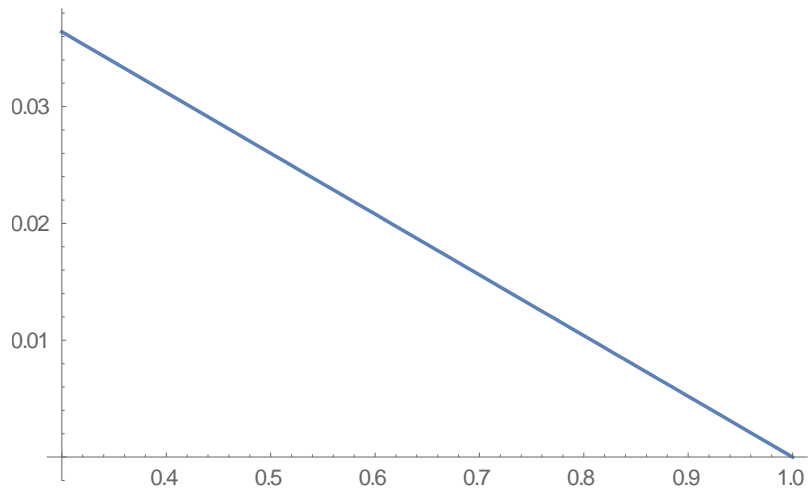


Figure 6: $T = 450 \text{ K}$, $\alpha > 0.3$.