

AFCoKaRE Practice Problem 15.4

Purpose: This problem allows you to practice the integral analysis of kinetics data obtained using a batch reactor.

Problem Statement: Suppose that the liquid-phase Diels-Alder combination of cyclopentadiene (A) and benzoquinone (B), reaction (1), was studied in the liquid phase using a 2 gal perfectly mixed batch reactor. The temperature was constant and the same in all of the experiments. In any one experiment the reactor was charged with known concentrations of A and B and the concentration of A was measured after a known reaction time. Using the resulting data, shown in Table 1, determine whether the rate expression in equation (2) accurately predicts the reaction kinetics. If it does, determine the best value for the rate coefficients, including 95% confidence limits.



$$r_1 = k_1 C_A C_B \quad (2)$$

Table 1. CSTR Kinetics Data for AFCoKaRE Problem 15.3

$C_{A,0}$ (M)	$C_{B,0}$ (M)	t_f (min)	C_A (M)
0.075	0.06	1.5	0.023
0.075	0.06	2	0.021
0.075	0.06	2.5	0.019
0.075	0.07	1.5	0.017
0.075	0.07	2	0.014
0.075	0.07	2.5	0.012
0.1	0.06	1.5	0.043
0.1	0.06	2	0.041
0.1	0.06	2.5	0.041
0.1	0.07	1.5	0.035
0.1	0.07	2	0.033
0.1	0.07	2.5	0.032
0.125	0.06	1.5	0.066
0.125	0.06	2	0.065
0.125	0.06	2.5	0.065
0.125	0.07	1.5	0.057
0.125	0.07	2	0.056
0.125	0.07	2.5	0.055