

Consider the REVERSIBLE reaction of A to B. Data have been taken using an internal recycle (“Berty”) reactor at high recycle ratio. The reactor is loaded with 100 g of catalyst and the volumetric flow rate is 10 liter/hr. In this series of experiments, only the inlet concentrations were changed. The following data were obtained:

C _{Ain}	C _{Bin}	C _{Aout}	C _{Bout}
0.56	0.76	0.42	0.9
1.54	0.035	0.72	0.85
1.13	0.44	0.62	0.95
0.75	0.18	0.37	0.57
0.16	0.19	0.11	0.24
0.33	0.79	0.32	0.8
1.36	0.049	0.64	0.77
0.52	0.38	0.31	0.59
0.60	0.72	0.43	0.89
0.91	0.063	0.41	0.56

Units of concentration are mol/liter. The flow rate and the concentrations are given at the temperature and pressure inside the reactor.

See if this rate equation can fit the data and, if it does, determine values of the parameters k_f (rate constant of forward reaction), k_r (rate constant of reverse reaction), K_A (equilibrium adsorption constant for A, liter/mol) and K_B :

$$-r_A \left(\frac{\text{mol}}{\text{g hr}} \right) = \frac{k_f C_A - k_r C_B}{1 + K_A C_A + K_B C_B}$$

Also make a plot of the rate calculated using this rate expression and the values of the parameters that you determined vs. the rate calculated from the experimental concentration measurements.