CE 329, Fall 2015

Assignment 25 Solution

Problem Statement

A gas mixture containing 5% of the reactant A and 20% of the reactant B (balance inert, I) at 350 °C and 2 atm needs to be processed to convert 80% of the A according to irreversible reaction (1). Reaction (1) is first order in A; the pre-exponential factor is 1.4×10^9 min^{-1} and the activation energy is 30 kcal mol^{-1}. The heat of reaction (1) is constant and equal to -25 kcal mol^{-1}, and the constant pressure molar heat capacity of the gas mixture is approximately equal to 4 times the ideal gas constant. If an adiabatic PFR with negligible pressure drop is used, what space time will be required and what will be the outlet temperature of the gas?

$$2\,A + B \rightarrow 2\,Y + 2\,Z$$