CE 329, Fall 2015

Assignment 28

Problem Statement

The elementary irreversible, liquid phase reaction A + B → C + D is exothermic with a heat of reaction that may be taken to be constant and equal to −8.5 kcal mol^{-1}. The rate coefficient obeys the Arrhenius law with a pre-exponential factor of 8.7 x 10^6 L mol^{-1} s^{-1} and an activation energy of 15 kcal mol^{-1}. What conversion can be expected if the 1.3 L min^{-1} feed (40 °C, 1M in both A and B) to a 500 L adiabatic PFR is pre-heated using the reactor effluent (assume a 10° cold approach)? The heat capacity of the fluid as a whole is constant and equal to 0.478 cal cm^{-3} K^{-1}.