

ChE-403 Problem Set 1.2

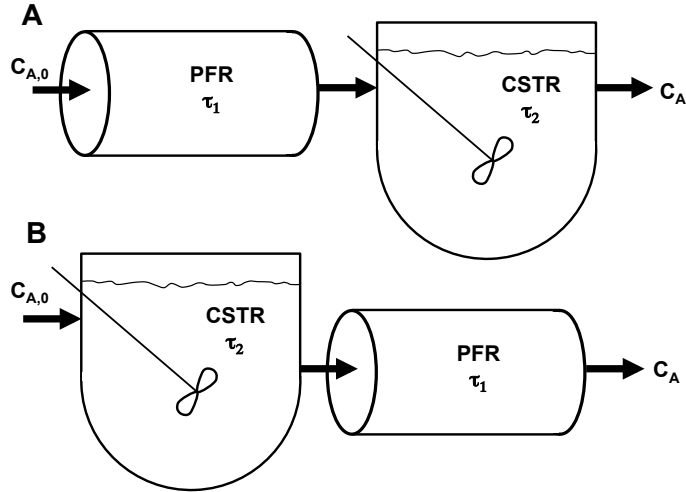
Week 2

Problem 1

Let's take a typical reaction:

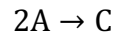


The reaction has first order kinetics. Can you calculate the concentration C_A after it has gone through these two different reactor configurations?

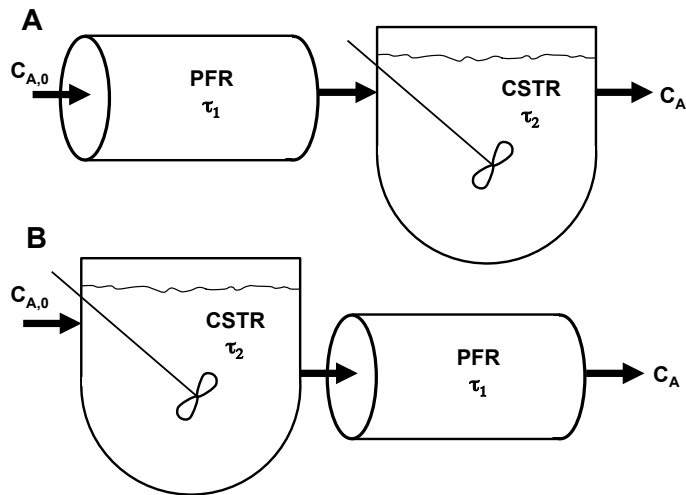


Problem 2

Let's take the same setups as for problem 1 but with the reaction:



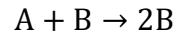
i) This time the reaction has second order kinetics. Can you calculate the concentration C_A after it has gone through these two different reactor configurations?



ii) Comparing your result with that of problem 1, can you conclude something about the applicability of using RTD functions for predicting concentrations for reactions that are order 2?

Problem 3

A typical autocatalytic reaction can look like:



The reaction has second order kinetics.

Starting from a mass balance of the reactor, can you derive an expression for conversion of A (X_A) as a function of residence time and k in a CSTR and a PFR with $C_A^0 = C_B^0 = 1 \frac{\text{mol}}{\text{L}}$?

