Abdelhafid BOUSSOUF University Center - Mila
Process engineering department
3rd year L.M.D – Homogeneous reactor
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Homogeneous reactor
Series N° 03 (Chapter IV)

Exercise 1:

We consider the reaction: A+B → 2C+D

This reaction (of the 2nd order, 1st order with respect to A and B) takes place in the liquid phase at atmospheric pressure. The feed of the reactor is done by adding 2 moles/liter of A and 2 moles/liter of B. we want to obtain a C concentration equal to 3.6 moles/liter.

Part 1:

1/ Give the equation of the speed as a function of the conversion rate X_A and the temperature T.

2/ Supposed that the reaction takes place in a closed reactor of $5m^3$ in an isothermal environment (T=20°c) with a rate constant k=4.5litre/mol. calculate the time needed to obtain the desired C concentration.

3/ By giving a flow rate of $5m^3/h$ calculate the necessary volume of a piston reactor used to achieve the same objective.

4/ In the same conditions as before, calculate the necessary volume of an open reactor used to achieve the same objective.

5/ If we have an open reactor with a volume of $5m^3$. Calculate the conversion rate X_A.

Part 2:

We consider a series of two open reactors of volume $2m^3$ and $3m^3$.

1/ Determine the value of the conversion rate X_A at the output constitute by:

- $2m^3$ reactor followed by a $3m^3$ reactor;
- $3m^3$ reactor followed by a $2m^3$ reactor;

2/ compare the performances of various reaction systems

Part 3:

We consider a series of 5 reactors with a volume of $1m^3$. determine the conversion rate at the exit of the 5th reactor.