Koya University

Faculty of Engineering

Department of Chemical Engineering

(Laminar Flow Reactor)

Prepared by:

Mohamed kadhim

Ali hewa

Twana

Supervised by:

Mr. Blnd Zrar

Table of Contents

List of figures

Aim

Determine Conductivity.

Find out conversion of Laminar Flow Reactor (LFR) .

Equipment

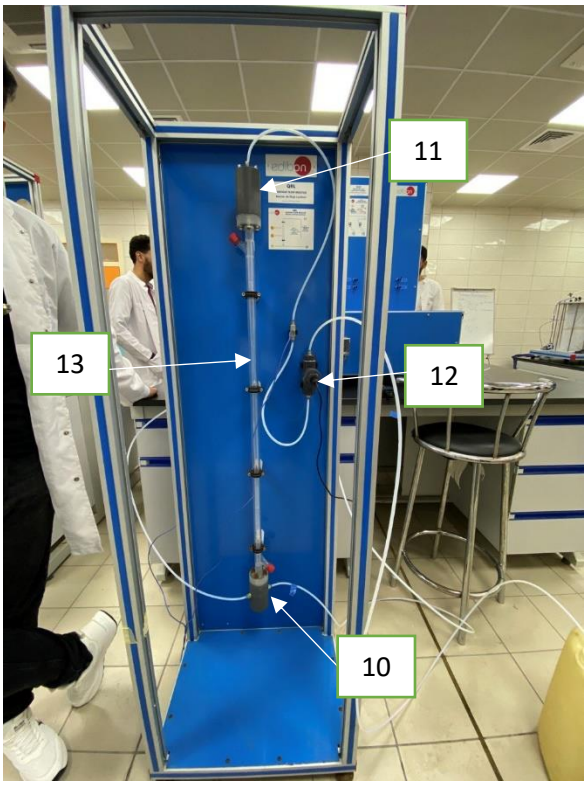

Figure 2 Laminar Flow Reactor

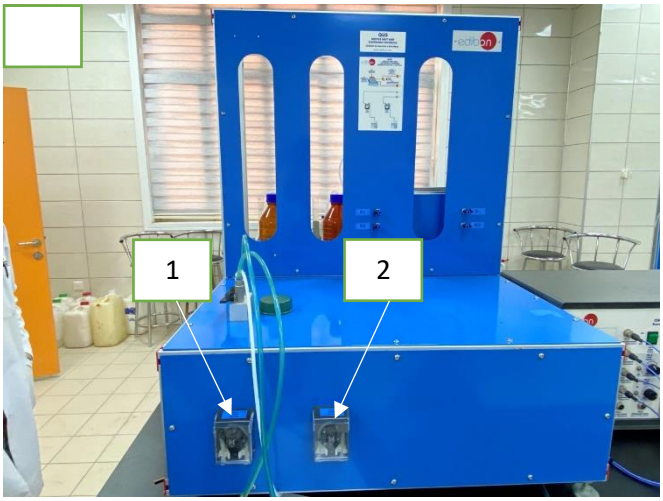

Figure 1 Service unit back part

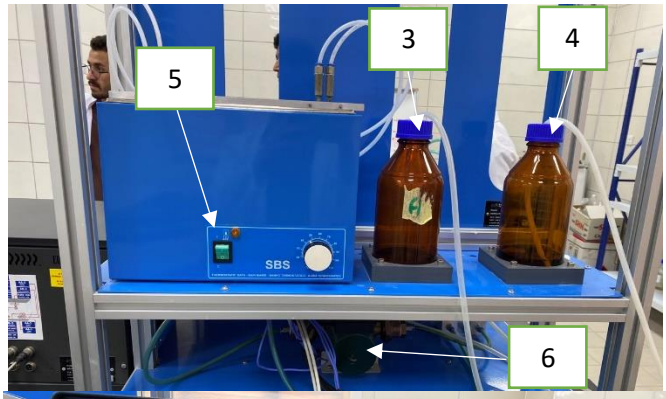

Figure 3 Service unit front part

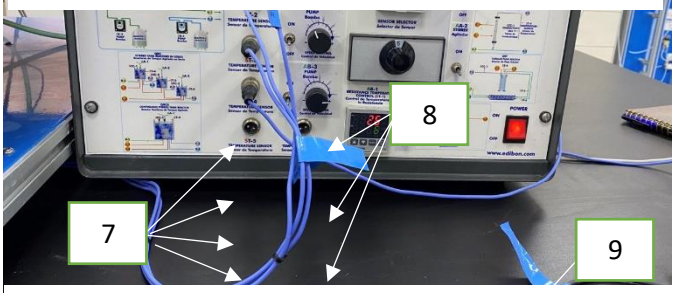

Figure 4 Control interface

1. Pump AB-2
2. Pump AB-3
3. Reactant 1
4. Reactant 2
5. Switch on/off of water bath.
6. Pump AB-1: is used to pump the water.
7. Temperature sensors: are used to measure the temperatures.
8. Switch pump AB-1, AB-2, and AB-3.
9. Switch on/off of control interface.
10. Bottom of the shell.
11. Top of the shell.
12. Conductivity sensor
13. Tube

Procedure

1. Prepare **1 L** and **0.05 M** of **NaOH (solution)**. after it, we need to prepare second reactant for reaction occur prepare **1 L** and **0.05 M** of **$CH_3COOHC_2H_5$ (solution)** .
2. First of all, in the service units close all valve **if open**. After that put the bottles in specific places in service unit. And be careful to that the pipes and valves are connected as well.
3. Turn on the switch control box (**power supply**).
4. In this experiment we don't use water bath because it operates under room temperature (**20 ^oC in this experiment**).
5. **Set** the limited flow rate of the reagents before run the steps.
6. **Switch on** pumps of reactants.
7. Take the reactants from their containers to the Laminar Flow Reactor **(LFR).**
8. Send both of reactants at same time by both reactant hose and reactants enter the reactor by long tube (inside tube).
9. The tube flow as laminar and then after a specific time to give us a product.
10. Product will out from the **top.**
11. To estimate the conductivity, we use the conductivity meter after output of the **LFR**. Also, join end of the hose of product with the sensor then the value of conductivity can be read on the display of the sensor.
12. At the end of the experiment, turn off the pumps.
13. Turn off the power of control interface box.
14. Reactants should be removed from both (1 and 2) reactant bottle container. Then, the liquids must be kept for following test.

Calculation

$\lambda = 3.8\, mS$

$$\frac{C_A}{C_{A\circ}} = \frac{\lambda - \lambda_\infty}{\lambda_\circ - \lambda_\infty} \rightarrow \frac{C_A}{0.05} = \frac{3.8 - 0.21}{8.7 - 0.21} \rightarrow C_A = 0.021M$$

$$X = \frac{C_{A\circ} - C_A}{C_{A\circ}} = \frac{0.05 - 0.021}{0.05} = 0.58 = 58\%$$

Discussion

(muhamed kadhim)

Throughout this experimentation we found conductivity and conversion of NaOH with concentration of 0.05M also second reactant which is CH3COOHC2H5 with same volume and concentration. First, we input reactants to below of LFR because if we put the reactants above the reactor, it will go fast down and it didn't have enough time to react because of gravity, and wait until they reach to conductivity meter then start reading conductivity (2) by conductivity meter. We can find conversion by concentration by this equation X=CA0-CA/CA0 so first we must find concentration by this equation Ca/Ca0=20-2/20-2∞o. Finally, after finding concentration we convert it to conversion by mentioned equation.

(Ali hewa)

This experiment about Laminar flow reactor (LFR), estimate conductivity and main aim of our experiment is that to finding out the conversion (X). In this experiment under room temperature of 20 °C we used NaOH and Ethyl Acetate (IL and 0.05 M). Then we recorded conductivity value by using conductivity meter/sensor, after that, estimate of (2) we find the Ca by equation and also find X by equation of the conversion.

however, we have some error in this experiment because maybe we doi ave exact conversion of the reactor