

Catalysis

version 01.4

Start up: The following steps should be taken before the Catalysis Experiment is started.

- 1) Verify that both Helium tank valves, the reactor feed and the GC carrier gas, are open. Line pressure should be around 60 psi. Do not adjust regulator.
(The He tank valves should be open at all times).
- 2) IMPORTANT: Monitor the pressure in the Helium tank providing GC carrier gas so that it does not drop below 100 psi.
- 3) Open the valves on the CO₂, and H₂ tanks located at the west end of the experiment. Line pressures should be around 50 psi. Do not adjust regulators.
- 4) Log into the PC located adjacent to the experiment using your CAEDM account. This computer doesn't run the CAEDM applications, but it will give you access to your J: drive as well as printing. Launch HP ChemStations (Instrument 1 Online) from the Programs menu. It takes several minutes to load.
- 5) Start up computer control by following the steps outlined in [Bailey Instructions](#) .

Computer Controls

Two computer systems are used to run this experiment. The reactor is controlled with the Bailey Distributed Control System and the HP6890 gas chromatograph, GC, is controlled and data collected using the PC running HP ChemStation located adjacent to the experiment.

Using the Bailey:
From Catalysis Screen 1;

- 1.) Confirm Main Power is on (A, F7).
- 2.) Turn on Heater Power (B, F7).
- 3.) Set Reactor Heater temperature set point between 225C-325C (C, F1).
To change the Reactor Heater temperature set point:
Select the Reactor Heater station window (C). Affirm that the station is in Auto mode; you should see a green "Auto" in the lower left hand corner of the station window (use **F6** to toggle between Auto/Manual).
Press **F1** to set the reactor heater temperature set-point.
Enter desired temperature and press **Enter**.
Press **F10** to deselect set-point entry mode and again to deselect window.
- 4.) Switch Reactor Pressure to automatic control (I, F6) and set pressure set point between 12.5 and 25 psia.

From Catalysis Screen 2;

5.) Confirm that the Calibration Gas Valve is closed.

This valve should always remain CLOSED, if found to be otherwise, contact lab personnel.

6.) Select Reactor Feed Valve to REACT (B, F9) and Reactor Exhaust Valve to GC (C, F7).

These settings will adjusted according to the process you wish to perform. As an example, they could be used as follows:

Feed to GC and reactor exhaust to vent (GC analyzes feed composition).

Feed to reactor and exhaust to the GC (analyzes product composition).

Feed to reactor and exhaust to vent (reaction occurs without analyzing, but pressure is not controlled).

From Catalysis Screen 3;

7.) Set the gas flow rates as desired.

To change H₂ flow rate:

Select the H₂ Flow station window (**A**)

Enter desired H₂ flow rate and press **Enter**.

To change CO₂ flow rate:

Select the CO₂ Flow station window (**D**)

Enter desired CO₂ flow rate and press **Enter**.

To change He flow rate:

Select the He Flow station window (**G**)

Enter desired He flow rate and press **Enter**.

To change N₂ flow rate:

Select the N₂ Flow station window (**J**)

Enter desired N₂ flow rate and press **Enter**.

Note that from the initial startup of the cold reactor to a thermal steady state may take an hour. Starting the reactor before the beginning of the lab period is highly recommended.

GC Sampling Procedure

Using ChemStation:

- 1.) Log in to ChemStation as an Operator using your UO Lab Group's name.
- 2.) Under the RunControl menu, select the Sample Info window.
- 3.) Enter the name of your group again in the subdirectory box. When you press **Enter**, a dialog box will appear if the directory doesn't exist and it can be created now.
- 4.) In the Signal 1 Filename box, enter a new file name being sure to use the .D extension.

- 5.) Using the Sample Name and/or Comment boxes, describe your experimental run for later identification.
- 6.) Click OK.
- 7.) When the green Ready light appears in the top left corner of the ChemStation window, click the start button.
- 8.) Don't use the Stop button. Let the run finish automatically. This will take 15 minutes to complete, but new reactor conditions can be set immediately.
- 9.) When the run is finished, repeat steps 2 thru 8.

Daily Shutdown

The following steps should be taken when powering down the Catalysis Experiment.

- 1) Set the following using the Bailey;
Heater Power: OFF
Reactor Temperature: 0C
Reactor Pressure: Auto, 14.7 PSIA
Reactor Feed Valve: REACT
Reactor Exhaust Valve: VENT
He Flow: 4 SCCM
H₂ Flow: 0 SCCM
CO₂ Flow: 0 SCCM
N₂ Flow: 0 SCCM
- 2) Close cylinder valves for H₂, CO₂.
- 3) Quit ChemStation and logout.