

EBULLIOMETER STUDENT MANUAL

Ch En 445

Procedure

Student Instructions

It takes 45-90 minutes for the system to reach steady state for a given set of operating conditions (composition, temperature, pressure), so the apparatus will be turned on and operating at steady state when you arrive. You will take two samples each of the liquid and vapor for this steady-state condition. You will be given more data for analysis.

Sample Collection

- Put on gloves to handle the samples
- Record temperature and pressure
- Gas Sample
 - Place a vial under the outlet from the Gas Sample Valve.
 - Turn the Gas Sample Valve to the *Sample Collection Position* as indicated in Figure 1. Condensed distillate will begin to drip into the vial.
 - Collect between 0.5 – 1 mL of sample.
 - Return the valve to *Operating Position* as indicated in Figure 1.
 - Cap the vial to prevent evaporation. Use a dry-erase marker to mark the cap with a G to indicate that it contains a gas sample.
 - Measure the refractive index of the sample using the refractometer (see below).
- Liquid Sample
 - Place a waste container under the Liquid Sample Valve.
 - Turn the Liquid Sample Valve to the *Drain Position* indicated in Panel A of Figure 2. Liquid will begin to flow into the waste container.
 - Drain 15 – 25 mL into the waste container.
 - Turn the valve so that flow stops as pictured in Panel B of Figure 2. DO NOT return the valve to default position as this will result in contamination of the liquid sample with the condensed distillate.
 - Place a vial under the liquid sample outlet.
 - Turn the Liquid Sample Valve to the position indicated in Panel C of Figure 2. Liquid will begin to flow into the sample container.
 - Collect between 0.5 – 1 mL.
 - Return the valve to operating position as indicated in Panel D of Figure 2.
 - Cap the vial to prevent evaporation.
 - Use a dry-erase marker to mark the cap with an L to indicate it contains a liquid sample.
 - Dispose of the waste in the organic waste container.

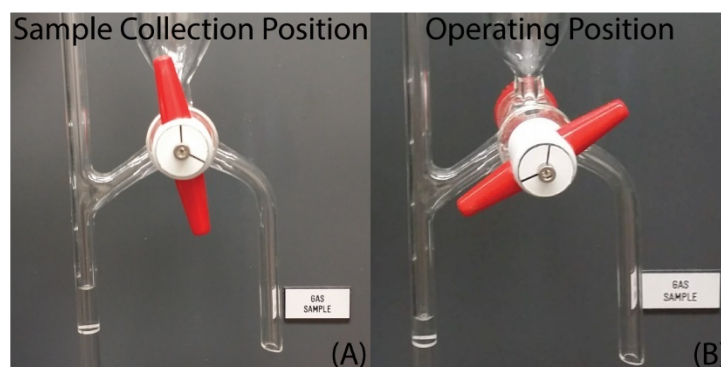


Figure 1 Gas Sample Valve positions. Left: Sample collection position. Right: Operating Position.

- Measure the refractive index of the sample using the refractometer (see below).

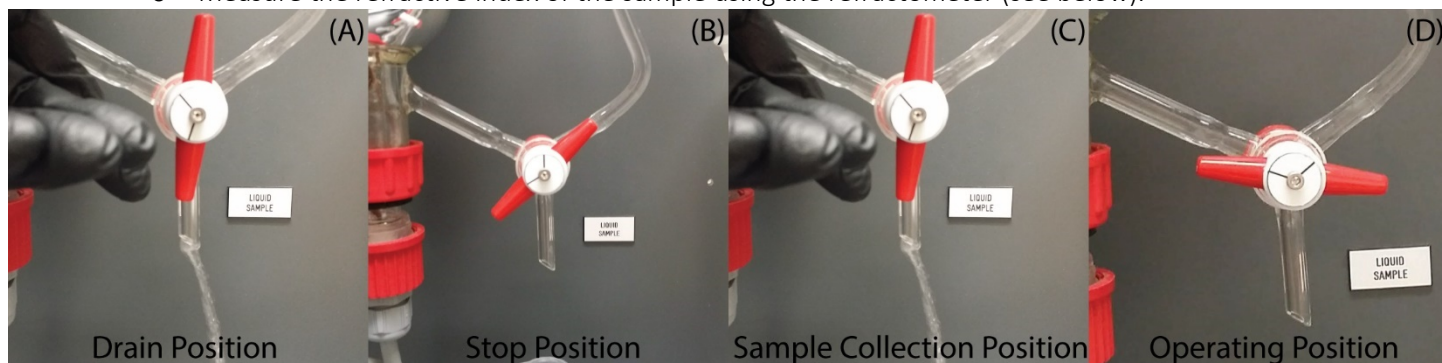


Figure 2 Liquid valve positions. A. Drain position, B. Stop position, C. Sample collection position, D. Operating position.

Sample Testing

- Measure the Refractive Index of a Sample:
 - Remove the cover from the sample well (See Figure 3).
 - Uncap the vial and take up a small amount into a disposable pipette to rinse the pipette, then take up more liquid into the pipette and place several drops of the sample into the well. Fill the well about halfway.
 - Replace the cover on the sample well and press the “Start” button shown in Figure 4. (Press anywhere on the screen if the interface is blank to wake up the machine.)
 - Empty the sample vial into waste vessel and place upside-down on a paper towel in the fume-hood to dry.
 - Wait for the machine to display the refractive index for the sample.
 - Record the refractive index.
 - Remove the cover and use a pipette to dispose of liquid from the sample well.
 - Clean the sample well on the refractometer with a Kimwipe and replace the cover.
 - Repeat the above procedure for each test sample.



Figure 3 Sample well on the refractometer.

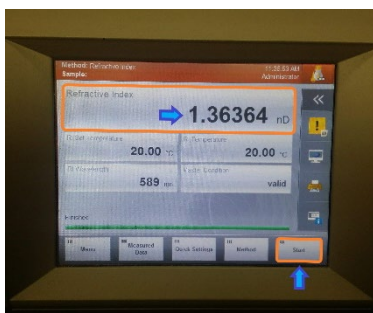


Figure 4 Refractometer user interface. The arrows indicated the location of the Start button and the read out.

Online Procedure

1. Read the Procedure above to understand what is happening.
2. Watch the video at http://walk-inlab.groups.et.byu.net/ChEn_385/Ebulliometer/EbulliometerTest1.mp4.
3. Watch the video at http://walk-inlab.groups.et.byu.net/ChEn_385/Ebulliometer/EbulliometerCloseUp.mp4.