THERMODYNAMICS AND TRANSPORT LABORATORY

TA INSTRUCTIONS FOR THE DIFFUSION THROUGH A STAGNANT FILM LAB

Ch En 385 – Knotts

Overview

- Students should spend about 1 hour in the lab. Part of this will be doing experiments, but make sure they are answering the analysis questions during waiting periods.
- Before operating the equipment alone, you should have passed it off with either Dr. Knotts, Will Davis, or Mike Beliveau.

General Instructions

1. Do the following to prepare for students.
    a. Learn how to run the equipment and pass off your understanding with either Dr. Knotts, Mike Beliveau, or Will Davis.
    b. Perform the experiments that the students will do.
2. You should have set up specific times (5 hours a week) for students to perform the experiments. You will be in the lab during these times.
3. You will setup the apparatus before each lab hour following the instructions below.
4. After students are finished with the lab, you will shut down the apparatus following the procedures below.
5. You can grade assignments when in the lab and not answering student questions; however, you should be closely monitoring the students.
    a. Keep them on task.
    b. Ask questions to deepen understanding.

Apparatus

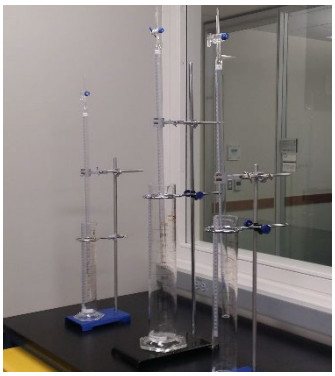

Figure 1 Three-cylinder diffusion test apparatus

We have three different sets of three graduated cylinders of varying sizes. Each set has a 500 ml, 1000 ml and 2000 ml graduated cylinder on a lab stand. Clamped above each cylinder is an inverted burette which sticks down into the cylinder with liquid in it and the lip at the level of the liquid. This way, as the liquid evaporates from the cylinder, the liquid in the burette drains into it, keeping the cylinder liquid level relatively constant. We then read the level in the burette to determine how much liquid has evaporated between readings. This is much more precise than measuring the level on the cylinder and is easier overall. The cylinders for ethanol and acetone are to be kept in the fume hood during testing.

The apparatus consists of:

- 3 sets of 3 burettes
- 3 sets of 3 graduated cylinders; one set for water, one set for acetone and one set for ethanol
    - 3 500 ml graduated cylinders
    - 3 1000 ml graduated cylinders
    - 3 2000 ml graduated cylinders
- 1 syringe and tube for drawing liquid up into the burettes

Figure 1 Large graduated cylinder

Set Up of the Starting Configuration

Do the following, **before students arrive**, if not already done.

1. Put on gloves and a lab coat.
2. Obtain the bottles of acetone and ethanol from the flammables cabinet by the north fume hood.
3. Fill the respective graduated cylinders up to the 28 cm mark.
4. Add 50 ml of test fluid to the cylinder.
5. Lower the clamped burette down to the 28 cm mark, below the level of the fluid.
6. Open the valve on the burette.
7. Take the large syringe and tubing.
8. Attach the one end of the tubing to the end of the burette.
9. With the other end of the tubing attached to the syringe use the syringe and tubing to draw fluid up into the burettes from the cylinders up to the 50 ml mark.
10. Adjust the burette height so that the lip of the burette is level with the top of the fluid, as shown.
11. Make sure the clamp is tight enough to hold the burette in place, but not so tight as to overstress the burette.

Figure 2 The lip of the burette at the fluid level.

The lab is now ready for students.

Lab Operation Procedures

While students are in the lab:

Students will take one reading the first day of the experiment for each of the cylinders. They will record the fluid level in the cylinder and in the burette. On the second day of the experiment, they will repeat these readings and calculate any difference over time.

Shutdown Procedures

Do the following after students have completed their testing.

1. Put on gloves.

2. Open the valve on the burettes.
3. Unclamp the burettes and remove them from the cylinders.
4. Allow the burettes to dry in the fume hood.
5. Loosen the ring on the stand and lift it over the cylinder while removing the cylinder from the stand.
6. Dump the remaining fluid into the proper waste containers. (Water may go into the sink, ethanol and acetone must be disposed of in the container labeled “organic waste”.
7. Allow the RO water cylinders to dry in the open and the acetone and ethanol cylinders should be allowed to dry in the fume hood.

Once the cylinders are dry, either the lab manager or his assistant will take them to their storage area.