Diffusion in Gas (MT1) - Initial Report

Expectations

* Determine the diffusion coefficient of the diethyl ether into air using a diffusion cell.
* Compare this to the the predicted coefficient as described by Chapman-Enskog theory

Procedure

1. Record the atmospheric pressure inside the lab.
2. Fill two thirds of the capillary tube with diethyl ether with a thin needle syringe.
3. Test that the dry air is blowing across the capillary at a rate that flushes the vapor without inducing mixing. This will involve a trial and error process to reach the proper flow rate.
4. Once the air flow rate is determined, use the syringe to withdraw excess diethyl ether to an initial vapor column height of about 1.1 cm.
5. Measure the height from the top of the capillary to the fluid-liquid boundary
6. Place the capillary into the water bath and wait 10 min. for the fluxes to come to a pseudo-steady state.
7. Record the height from the top of the tube to the fluid-vapor boundary layer every 10 minutes for one hour.
8. Repeat above procedure at different temperatures ranging from 1-33 degrees celsius. Use ice for the trial below room temperature.

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The goal of this experiment is to determine the diffusion coefficient of diethyl ether by use of a diffusion cell and then comparing the results to the predicted coefficient as described by Chapman-Enskog theory.

The experiment is performed by first adding two thirds of diethyl ether to a capillary tube by use of a thin needle syringe. This is done in order to test the dry air flow blowing across the capillary so that it flushes the vapor without inducing mixing. Once the air flow is determined, use the syringe to withdraw the diethyl ether to an initial vapor column height, which will be the basis for all measurements. Place the capillary into the water bath and wait 10 minutes for the fluxes to come to a pseudo-steady state. Record the height from the top of the tube to the fluid-vapor boundary layer every 10 minutes for one hour. Repeat the above procedure at different temperatures ranging from 1-33 degrees celsius. Use ice for the trial below room temperature.