FTIR of CO Script Draft [Assumption is that myself and Ellie will be switching on and off]

Words on Video: FTIR of CO: Introduction

VO: "In this experiment, the rotational-vibrational spectrum of CO will be collected using an IR spectrophotometer."

VIDEO pans in on spectrometer, and then to attached computer.

VO: "The spectrometer should be turned on and ready to go prior to your arrival in lab. The software needs to be set up in order collect spectra prior to obtaining a sample."

VIDEO close-up on computer screen, with researcher in view.

VO: "Open the software and select the appropriate settings for CO. This will set the appropriate range (up to 4500 wavenumbers) and resolution (1 wavenumber) to allow for the relevant data to be collected. Once the software is prepped, it's now time to obtain a blank."

Words on Video: Sample preparation

VIDEO is now centered on researcher, next to vacuum line, holding gas cell.

VO: "This is the gas cell, which will be initially evacuated to record a blank and then filled with CO for the spectrum to be taken."

VIDEO zooms in on researcher holding the gas cell.

VO: "The cylindrical body of the cell is made of glass, and has transparent salt-based (NaCl) windows through which IR electromagnetic radiation will be shone through in order to probe the sample. There are two stopcocks on the top. One will remain closed at all times, the other will be used to connect to the vacuum line."

Researcher sets down the gas cell, and walks over to the vacuum line. The trap has already been prepped and the vacuum pump should be on.

VIDEO adjusts accordingly to show researchers close to the vacuum line.

VO: "This is the vacuum line which will allow for the evacuation of the gas cell to take a blank, and also for the cell to be filled with CO. The vacuum is pulled through this line (points to line), and a cold trap is used to ensure that pump oil vapors do not contaminate the line. At this moment, all exterior stopcocks are closed. We now want to turn on the pressure gauge to monitor the pressure of the system"

VIDEO zooms in to pressure gauge as it is turned on by researcher.

VO: (Turns on gauge) "This gauge measures the pressure in the system. Note that the value is currently negative due to the fact that a vacuum is being pulled. Note also that this gauge measures the pressure in inches of mercury as opposed to metric units. You'll need to convert the appropriate pressure of CO from Torr to inches of mercury. We will now evacuate the gas cell to ensure that it is void of gases that might contaminate the sample."

VIDEO zooms to region where the gas cell is placed and hooked up to the line.

VO: (While placing gas cell on clamp) "The gas cell sits on this clamp. The TA will ensure that it is secure, and then will hook the plastic tubing into the nozzle. Notice that the stopcock is perpendicular to the tubing. This means it is in the closed position. First, the line directly to the vacuum must be opened (unscrews black stopcock). Then, the gas cell itself needs to be opened in order for it to be evacuated. (Unscrews gas cell stopcock)."

(Waits a few seconds)

VO: "The cell is now sufficiently evacuated. The cell is now cut off from the vacuum directly (screws in gas cell stopcock), and then the stopcock is closed to the main vacuum line (screws in black stopcock). We are now ready to take our blank."

VIDEO moves back over to spectrometer. Researcher opens the sample chamber and prepares to place the gas cylinder in it.

VO: "The cell fits into the first of the two grooves in the plate such that it is secure. The beam passes through the transparent salt windows and goes to the detector on the other side." (Closes sample chamber).

VIDEO shows researcher next to computer.

VO: "Select 'collect blank' in order to take the blank of the evacuated gas cell. Collection will take a bit of time, since 128 scans will be taken in order to enhance the signal to noise ratio. This takes some time due to the fact that we are at a relatively high resolution."

VIDEO can cut off for now and return once the blank has been taken.

VO: "The blank has now been taken. Note that there is only a bit of residual CO_2, likely in the sample chamber. Thankfully, this will not interfere with our CO sample. We are now ready to fill the gas cell with CO."

VIDEO pans back over to the vacuum line area.

VO: "Your TA will fill the gas cell with CO as follows. First, the gas cell is hooked back up to the vacuum line. At this moment, vacuum is still being pulled through the whole system. We close off the vacuum by screwing in the stopcock on the trap."

VIDEO should pan toward the gauge. One researcher should be at the gauge, the other should be near the CO tank.

VO: "At this point, the pressure should be zeroed out on the gauge, since we are only interested in the pressure of CO that will be added to the cell." (Zero out the gauge). "Now the CO gas will carefully be turned on." (Gas should be turned on). "Note that the pressure is increasing on the gauge."

VIDEO should zoom out <u>before</u> desired pressure is reached. Students need to do this calculation themselves prior to lab.

VO: "Now that the desired pressure of CO has been obtained, the CO gas is now shut off and the gas cell's stop cock should be closed. Prior to physically detaching the gas cell from the line, the vacuum should be turned back on with the waste stopcock open (to fume hood) in order to remove excess CO from the line."

VIDEO should show researchers making those adjustments, and then cut off before moving back over to spectrometer.

VO: (Researchers should situate the gas cell back into the instrument. No need to show the positioning again). "Now the gas cell with the CO is in the instrument. Select 'collect sample' from the menu, and the scans (up to 128) will begin."

VIDEO should cut off, as before, and return once the spectrum has been collected.

VO: "Notice now that we have the spectrum of CO with the background subtracted. To highlight the spectrum, simply click on it (researcher should show clicking on and off a couple of times). Once a spectrum is highlighted, the pertinent areas can be zoomed in on. Note the presence of the intense CO fundamental around 2100 wavenumbers (researcher should zoom in on this, pause, and then zoom out to the main spectrum again). Note the considerably less intense first overtone at around 4200 wavenumbers. (Researcher should repeat process: zoom in for a bit, then back out). To save the data, select file, save as, and select the following location: local→users→public→public documents→CO. Be sure to save the file as .CSV, as this will allow for easy access to the data in Excel and Origin. Also save the data to your H drive so that you can access it later for analysis."

VIDEO should cut off for now.

Words on Video: FTIR of CO: Cleanup

VIDEO should be back over near the vacuum line. The gas cell is hooked back up.

VO: "Cleanup for this experiment is relatively straightforward. The CO within the cell should be vacuumed into the line and allowed to exit through the line to the fume hood. Once the cell has been evacuated again, the cell should be removed and stored in a dessicator to prevent moisture from dissolving the salt plates. The pressure gauge and vacuum pump should be shut off, and the program on the computer should be closed."