**Title: AIT Measurement Apparatus Standard Operating Procedure**

*Last Modified on: 8/1/16*

1. **Preparation**

*Flask and Lid*

* + 1. Use a 500 mL, round bottom, long2neck flask
    2. If dirty, wash out the flask using soap and water and dry as much as possible
       - Any leftover water will boil away when the furnace heats up and before any measurements are taken
    3. Wrap entire flask in aluminum foil with thermocouples at the bottom, side and top of the round part of the flask (thermocouples should be touching the glass directly)
       - Start by getting a long strip of aluminum foil (8" wide or so) and wrapping it around the middle of the flask
       - Poke thermocouple #3 through the foil near the bottom so the bead sits at the bottom of the flask and then wrap the foil around the bottom
       - Slide thermocouple #2 down to the middle of the flask between the flask and foil and start to wrap the foil up the flask
       - Place thermocouple #1 at the top of the bulb of the flask and wrap the rest of the foil up around the top
       - Wrap additional foil around the neck of the flask to cover it completely and secure flask in lid assembly
       - Make a "donut" of foil that will rest up against the bottom of the lid assembly
    4. Loosen the nut on top of the lid assembly and slide the corresponding half of the ceramic part of the lid assembly out
    5. Place the flask in the ceramic part of the lid assembly with the lip of the flask fitting into the groove of the ceramic
    6. Slide the loose half of the ceramic back in to be snug around the flask neck and tighten the nut on the top to hold it in position
       - The two halves nearest to the top of the assembly should meet or very nearly meet; if they don't then some foil should be removed from the neck of the flask
       - Use a circular spring to help hold the halves together
    7. Slide the foil "donut" up so it is flush against the ceramic and basically seals the opening
    8. Carefully turn the flask/lid assembly over making sure the flask doesn't fall out
       - The flask will fit into the lid assembly somewhat loosely, but it shouldn't fall out
       - If the flask falls out, remove it and add more foil around the neck
    9. Guide the thermocouple wires in the gap between the two ceramic halves so they are out of the way when the flask/lid assembly is inserted into the furnace
    10. Place the prepared flask/lid assembly into the furnace

*Furnace*

* + 1. Power on furnace and set temperature for initial measurement
       - To change the set point, press the up or down arrows until the desired temperature is reached
    2. Insert flask interior thermocouple (#4) carefully down the flask neck, making sure it goes straight in and the bead doesn't get caught anywhere
       - The bead of thermocouple 1should be suspended in the approximate middle of the flask, not be touching any part
       - Use the bracket on one of the two handles on top of the lid to secure the thermocouple in place
    3. Connect the thermocouples to the DAQ

1. **Measurement and Data Collection**
   1. Startup the computer and log on
      1. Username: McKay
      2. Password: asdfghjkl (Home row on QWERTY keyboard)
   2. Open "AIT Data Collection.vi" (Shortcut Located on Desktop)
   3. Press the "run" button to start the program
   4. Measure out sample
      1. Draw sample amount into a right2angle syringe
      2. Sample size:
         * Initially use a sample size of 100 microliters
         * Once AIT is measured for 100 microliters, go to 150 microliters
         * If the AIT decreases for 150 microliters, go to 200/250 microliters
         * If the AIT increases for 150 microliters, go to 50 microliters
   5. Enter the filename in the textbox
      1. Path: "C:\AIT\<COMPOUND NAME>\<FILENAME>.txt"
      2. Filename naming convention:
         * Filenames will be organized by the following values in order separated by underscores ("\_")
           1. Compound name
           2. Sample size in microliters
           3. Temperature in degrees Celsius
           4. Date of experiment with the format "YYMMDD"
         * For example: The filename of an AIT experiment where 100 microliters of hexane were tested at 450 C on March 19, 201would be: "hexane\_100\_450\_130319.txt"
      3. Make sure to press enter to save the filename in the LabVIEW program
   6. Set a timer for 10 minutes but don't start it yet
   7. Depress the pedal marked "D" to initiate data collection
   8. Introduce your sample about 325 seconds after initiating data collection
      1. Immediately begin the 10 minute timer and depress the pedal marked "L" to turn off the small light in the hood
   9. Watch the mirror above the furnace for any flame/glow for 10 minutes
      1. If a flame or glow is observed, document it (color, size, brightness, sound) and then continue data collection for minute after the flame or glow has disappeared, then terminate data collection
         * If the flame is bright yellow/orange, this is the hot2flame autoignition and the temperature should be decreased for the next test
         * If the flame is faint and blue2ish, this is the cool2flame autoignition and the temperature should be increased for the next test
         * **The reported AIT is the minimum temperature at which hot-flame ignition occurs**
         * If no flame or glow if observed by the 10 minute mark, increase the temperature for the next measurement
      2. *The bracket size goal for AIT measurement is +- 3 deg C*
   10. Prepare for the next measurement
       1. Set furnace to next temperature
       2. Clean out the flask between measurements by blowing hot air into the flask for 5 minutes using the heat gun
       3. Wait a minimum of 10 minutes between measurements for the furnace to equilibrate at the next temperature (5 min w/heat gun, 5 min to equilibrate)
   11. Start this procedure over from the third step (measuring out a sample)
2. **Cleanup/Shut-Down**
   1. The furnace may be too hot to open for several hours
   2. Once the furnace is cool, remove flask/lid assembly
   3. Remove flask from lid and remove the aluminum foil
   4. Wash out flask with soap and water (scrubbing stains if necessary) and place on drying rack
   5. Do not rinse out needles