UCI KCCAMS Facility

Pounding targets for AMS measurement
UCI wheel and cathodes
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I. Introduction

In the $^{14}$C AMS technique, the element of interest (carbon sample) is chemically separated from the original sample and is loaded as a solid target (graphite) in the sputter ion source (Fig. 1) of the Accelerator Mass Spectrometry (AMS) System. The graphite powder is loaded into an aluminum target with the aid of a one-part aluminum target holder. The powdery graphite sample is condensed to a pellet using a pressing apparatus. The loaded aluminum target is then transferred from the assembled target holder to the wheel. The wheel (Fig. 2) can hold up to 40 targets and is the apparatus which, will be loaded into the ion source of the particle accelerator.

II. Drilling UCI cathodes

1. Put on gloves and goggles.
2. Check that the lever (figure 3) has the right depth using the reference cathodes inside the drawer.
3. Take out undrilled UCI cathodes from the container labeled “Clean UCI Cathodes Not Drilled”
4. Place a cathode, funnel faced up, onto the machine right underneath the drill bit. Place thumb on the cathode so that it will not move while you are drilling. (figure 4)
5. On the right hand side, flip switch to “On”.
6. Pull down the lever that is on the right hand side of the machine. Pull down until the metal on the left hand side prevents it from going down any further.
7. Keep going up and down until you get a clean hole in the cathode.
8. Tap the cathode upside down on a clean surface to take out any residual metal. Using an air
dusty can, spray into the hole.
9. Periodically check the drill bit for any loose ribbons of metal that stick to the drill bit. Do
d this by turning off the machine and using the brush to remove the metal.
10. Repeat steps 2-6 until desired amount of cathodes are drilled.
11. Clean up area after use.

III. If "drill bit" breaks

1. In case the drill bit breaks, go to the drawer labeled “UCI Cathodes Implements and
   Tools for Drilling”
2. There you should find a plastic bag containing white cylinders with green tops labeled
   #58. Each container is a new drill bit.

IV. Preparation for pressing AMS targets into UCI cathodes

1. Using a "Target Press Form" assign the wheel position of the standards and unknown
   (UNK) samples. The "Target Press Form" should have the UCIG # and will tell you how
   many OX-I, OX-II, alpha and UNKNOWN need to be pressed. This form will eventually
   be added to the “Runlog book” kept in the AMS Lab. You can either use the photocopied
   sheets above the hood or you can type one on a template found on the AMS prep-lab
   computer (Irvine 5).
2. Once samples are assigned, write a "Sample Submittal Sheet". This document should include information on your samples such as what your samples are, when you got them, location obtained and any pretreatments done. Include any information that may seem useful to someone who is unfamiliar with your samples. This sheet should be placed in the “AMS submittal sheet” binder in the AMS Lab.

3. The order of pressing is as follows: OX-I, OX-II, Calcites, Unknowns and Alphas. The synthetic graphite Alpha is a very fine powder. Press it separate from the others to help to avoid cross-contamination with other samples. Using the background scoop provided (in small background dessicator on left-hand side of the pressing station), add 6-8 scoops of powder to generate one sample. Change gloves after cleaning, between each sample type and several times while pressing the unknowns.

V. Procedure of how to press using UCI cathodes

1. Turn on the light and the blower in the pressing hood.
2. Clean the pressing hood by wiping the surface with ethanol using a kimwipe. Put an aluminum foil down that has been wiped down with ethanol.
3. Take out the pressing tools, which consist of the portable pin and the UCI cathode holder located in the hood. Clean the pressing tools with both ethanol and air duster (Dustoff).
4. Choose the first standard on the list.
5. Check that the sample number on tube matches the number on the list.
6. Take a drilled UCI cathode and write down the UCIG number on the cathode using an ultra-fine sharpie.
7. Place the cathode into the UCI cathode holder.
8. Take the right sample and turn the graphite tube upside down so that the graphite falls into the funnel shape of the cathode (figure 5).
9. Keep empty tube in hood until finished with sample. The sample tube can then be thrown away in the glass waste below the island.
10. Using the portable pin, gently crush the graphite, if necessary, into powder.
11. Press graphite into the hole of the UCI cathode using force from your hand. Do this until most of the graphite is in the hole.
12. Then using a hammer, (figure 6) hammer the portable pin to press the graphite firmly into the hole. If this is done too early, sample will be lost because the force from the hammer will cause the sample to fly out.
13. Continue hammering until all the graphite is in the cathode.

![Fig. 5. Putting graphite into the cathode.](image1)

![Fig. 6 Using a hammer to pound the graphite.](image2)

14. Remove cathode and tap it upside down to eliminate any residual graphite from cathode funnel and then place into the correct position on the wheel.

15. If the wheel is not available for loading, place the pressed graphite cathodes into plastic bags and label each individual bag. After you press all the samples, place them into a big plastic bag with your name and index cards.

16. Both the portable pin and the UCI cathode holder needs to be cleaned as well as the area surrounding after each sample.

17. Take a small kimwipe with ethanol on it and wipe down the portable pin as well as the UCI cathode. Using the air duster, spray the UCI cathode holder.

18. When all the samples are pressed, make sure everything is put away.

19. Throw away the foil that was used on the hood surface.

20. Turn off hood light and fan.

VI. Pressing background machine samples (alpha, Ceylon graphite, etc.)

**Alfa Aesar (synthetic graphite)**

1. Select the zero machine cathode position in the wheel to be the background.

2. The amount of alfa sample can vary from 6-8 scoops (15-20mg). For better results add 2 scoops then press and continue this until you have added 6-8 scoops.

3. Use the background scoop provided (found in the background dessicator).
**Ceylon graphite (geological graphite)**

1. Scratch the surface of the ceylon onto weigh paper. Discard this powder.
2. Scratch enough of the newly exposed material to have about 6-8 scoops of material.
3. Press the 6-8 scoops carefully. The sample is slippery and may be hard to press.
4. After pressing check the cathode under the microscope to ensure pressing was successful.

**VII. If Pin Breaks**

1. If when pressing, the pin breaks, first take the broken pin out by unscrewing the two sides of the apparatus using the Allen-key. The tools can be found in the drawer directly under the UCI Cathode drilling machine.
2. If pin can be pulled out by hand, then do so, if not, pull it out using tweezers.
3. If new pin needs to be cut, go to tool box in the AMS lab and take out the Dremel and the Cut-Off Wheel #409.
4. Go to the back of the room where the AMS Machine is located. Using the Vise, securely place the un-cut pin in it. Using the Dremel, cut the pin at a length of around one centimeter to a centimeter and a half (depending on your preference).
5. Put the pin back into place using the Allen-key again.

**VIII. Loading the wheel:**

The UCI wheel has 40 independent positions from 0 to 39. (figure 2) Usually, position 0 is designated to be loaded with Alpha Aesar synthetic graphite (or any other $^{14}C$ free graphite), which is used for the initial warm-up of the ion-source and for machine background testing. Background graphite can be found in the desiccator on the left side of the pressing station.

Any wheel to be measured has to have at least six OX-I's loaded and more than one modern standard (OX-II or ANU). Other standards will be select in accordance with the expected age range of unknown samples.

1. Once the UCI cathodes are pressed and labeled, simply place the cathode, faced up, into the correct position on the wheel.
2. Finally, place the loaded wheel into a plastic bag with your name, and attach it to a wheel sheet with the cathode positions related with the sample lab code numbers.
IX. Cleaning the UCI wheel:

1. Take pliers and pull out the used UCI cathodes from the wheel and place them in the used cathode container to be recycled.
2. Then simply take a small kimwipe and put some water on it (slightly damp, not soaked) and wipe the surface clean.
3. Dry the wheel out, using an air dusty can. BE SURE THAT WHEEL IS THROUGHLY DRY.