

UCI KCCAMS Facility

Pressing 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) 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.

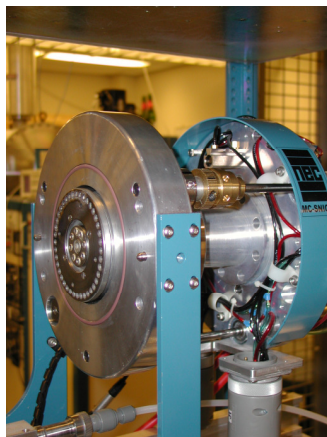


Fig.1 Ion Source of AMS System

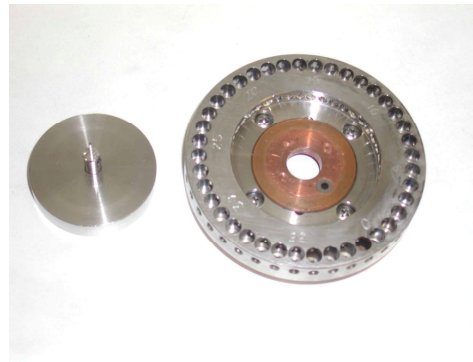


Fig. 2 UCI Wheel and Pressing apparatus

II. Drilling UCI cathodes

1. Put on gloves and goggles.
2. Check that the lever has the right depth (0.160") as seen in Figure 3.

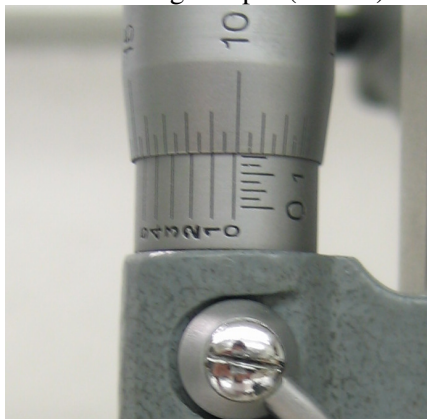


Fig 3. Hammer set to 0.160"

3. In order to fully check if the depth is truly set correctly, set the drill to 0". Flip cathode upside down and bring the drill bit down. The left side hammer should hit the same time the drill touches the cathode as seen in figure 3. If the hammer and drill touch at the same time, reset the drill to 0.160".

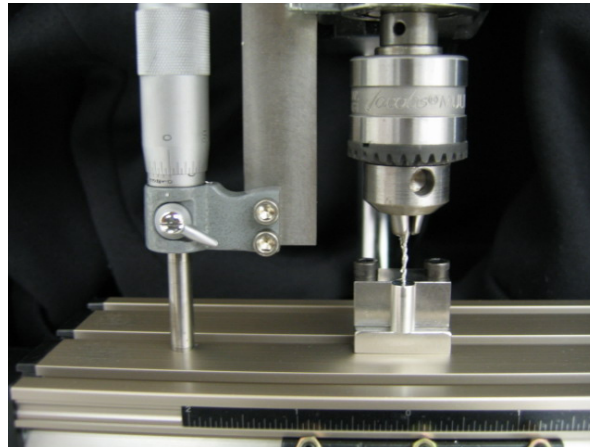


Fig 4. Drill being set

4. Take out undrilled UCI cathodes from the container labeled "UCI Cathodes Drill Out, Blow Chips Out"
5. 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)
6. On the right hand side, flip switch to "On".
7. Pull down the lever that is on the right hand side of the machine. Pull slowly down until the left side hammer prevents it from going down any further.

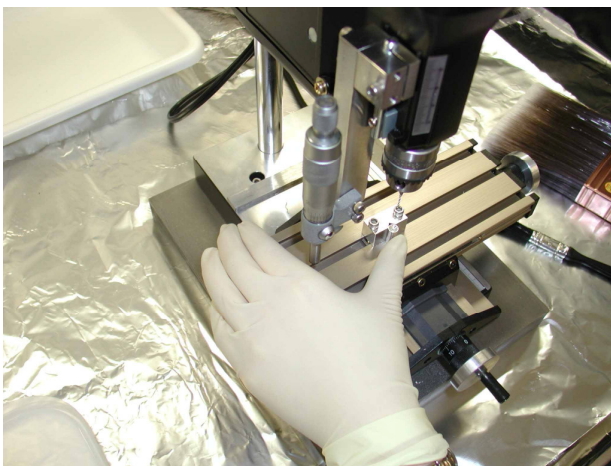


Fig. 5 Drilling machine and the correct way to hold the cathode in place



Fig. 6 Using lever to drill into UCI cathode.

8. Tap the cathode upside down on clean surface to take out the residual metal. Using an air duster can, spray into the hole.
9. Periodically check the drill bit for any loose ribbons of metal that stick to the drill bit. Do 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 clear plastic container labeled "Drilling and Pressing Parts" in the above cabinet.
2. There you should find a plastic bag containing white cylinders with green tops labeled #58. Each container is a new drill bit.

IV. Procedure of how to press using UCI cathodes

1. Turn on the light in the pressing hood.
2. Put a sheet of aluminum foil down.
3. Take out the pressing tools, which consist of the portable pin, the baseplate and alignment collar located in the hood. Clean the tools:

Blow off the baseplate and the inside of the collar with the air duster. (Note: Always use air duster OUTSIDE the pressing station, so you don't blow graphite around). Use a Kimwipe on the baseplate if you wish, but always blow off with air duster afterwards.

Clean the end and the sides of the pin with emery: -600 grit or finer. A narrow strip of emery is useful for cleaning the sides -fold it around the pin and rotate the pin once or twice, using a new clean spot on the strip each time you clean the pin. Wipe off the sides and the end of the pin with a Kimwipe (it's a good idea to do this twice – pick a new clean part of the Kimwipe for the second wipe) and blow off with air duster. Use a good hard blast with the nozzle very close to the end of the pin. Shake the air duster container vigorously every time you use it and lay it on its side, to avoid running short of propellant. Do these steps after EACH sample.

4. Choose a sample from the client box.
5. Check that the sample number on tube matches the number on the wheelsheet.
6. Take a drilled UCI cathode and write down the UCIG number on the cathode using an ultra-fine sharpie. In order to do this, you may want to hold the cathode with a pair of needle nose pliers.
7. Place the cathode into the UCI cathode holder.
8. Take the correct sample and load the graphite into the cathode. (figure 8).

a) To empty the graphite from the graphitization tube into the conical depression in the sample holder:

Hold the baseplate and sample holder tilted 45°.

Hold the tube horizontal, between your thumb and forefinger, with the lip resting on the lip of the sample holder. The body of the tube should be above your hand, not inside it, so you can see what you're doing.

Raise the back end of the tube to tilt it to 45°, so the mouth of the tube makes contact around the entire edge of the sample holder. Some graphite may roll down into the sample holder at this stage.

Tilt the tube and baseplate together until the baseplate is flat on the bench and the tube is vertical.

If necessary, tap sideways on the tube with a spatula to dislodge the last of the graphite.

b) Tap the graphite down by hand using the pin holder. The graphite should fill the hole almost to the top, and you may have to push quite hard to get it all in. Push sideways against the sample holder with a forefinger to prevent the holder lifting out of the baseplate when you withdraw the pin. Tapping the side of the baseplate with a finger or a spatula helps move the graphite down towards the hole.

c) When all of the graphite is inside the hole, leave the pin holder in the hole, place the alignment collar over it, and place the whole loading assembly in the press. Ensure the baseplate is properly aligned on the press plate, and then use the press to compress the graphite. As of early 2011 we are pressing to around 450-500 psi on the gauge – just under the pressure where pins will jam. If you have trouble reaching this pressure the press may need to be lubricated – ask for help.

d) Take off the collar and separate the pin holder and sample holder. You may have to pull quite hard and rotate the pin holder slightly to remove it. The surface of the graphite should be flat and shiny (check under microscope): if not, replace the sample holder, collar and pin holder, and press it again.



Fig. 7 Putting graphite into the cathode.

9. Remove cathode and tap it upside down to eliminate any residual graphite from cathode funnel and then place into the correct position from the wheelsheet into the clear plastic tray labeled 0-39.

10. Keep empty tube in hood until finished with samples. The sample tubes can then be thrown away in the glass waste bin.

11. After you press all the samples, place the labeled tray into a plastic bag with client's name and index cards. Place the bag inside the wet cabinet beside the pressing station
12. When all the samples are pressed, make sure everything is put away.
13. Throw away the foil that was used on the hood surface.
14. Turn off hood light.

V. If a pin sticks in the holder:

Take the sample holder and pin holder to a vice, which must have soft jaws (Cu or Brass). Place the sample holder in the vice and pull on the pin holder (NOT the sample holder) with a large pair of pliers. Do not pull at an angle or the pin will break off.

VI. If a new pin needs to be cut:

1. First take the broken pin out by unscrewing the two set screws on the sides of the apparatus using the Allen-key. The tools can be found in the drawer directly under the hood.
2. Get a new pressing pin from the clear plastic container labeled "Drilling and Pressing Parts" from the cabinet above and to the right of the pressing station. Make sure the pin is a #58 and from a bag labeled "GOOD".
3. Place the pin in the center of the mouth of the pliers found in the drawer just below the hood. Let the flat top of the pin sit just a few mm from the top of the flat surface. Close the pliers, then with the needle nose pliers, snap the pin.
4. Place the "snapped" end of the pin inside the holder, leaving the flat side out to be used for pressing.
5. Replace the two screws and tighten with the Allen-key.

VII. If a pin breaks and will not come out of the pin holder:

1. First take the broken pin out by unscrewing the two set screws on the sides of the apparatus using the Allen-key. The tools can be found in the drawer directly under the hood.
2. Find a piece of drill rod 1.5-2" long, or a size that will fit into the threaded hole without damaging the threads (3/32" or a #36 number drill), or an appropriately sized punch – there should be one in the drawer to the right of the pressing station.

3. Place the pin holder horizontally on a vice with the jaws open just a crack (say 1/8") so the holder sits part way down into the crack and cannot roll around.
4. Place the drill rod or punch in the threaded hole, resting on the pin, and strike sharply with a hammer.
5. The end of the pin will be sheared off and the remaining piece will be ejected from the axial hole.

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 a ^{14}C free graphite (blank), which is used for the initial warm-up of the ion-source and for machine background testing.

Any wheel to be measured has to have at least six OX-I's loaded. Other standards will be selected in accordance with the expected age range of unknown samples.

1. Once the UCI cathodes are pressed and labeled, simply place the cathode, face up, into the correct position on the wheel following the wheelsheet. Press the cathode all the way in using the needle nose pliers.
2. Finally, place the loaded wheel into a plastic bag with the client's name written on it.

IX. Cleaning the UCI wheel:

1. Once the Cs beam position has been checked, take pliers and pull out the used UCI cathodes from the wheel and place them in the used cathode container to be recycled.
2. Use sandpaper to firmly rub the wheel for ~1 minute.
3. Apply methanol to 5-10 cotton tips and clean the inside of the cathode holders in the wheel. Go over each cathode holder at least twice for a few seconds with a cotton tip.
4. Then simply take a small kimwipe with methanol on it (slightly damp, not soaked) and thoroughly wipe the surface clean.
5. Wipe the wheel with a large dry kimwipe.
6. Blow the wheel with an air duster.
7. Set the heatgun at 10 and dry the wheel for 1+ minutes.
8. Let the wheel cool for about 1 minute and place into a "clean" labeled plastic bag.