

Gluing Kapton Cylinder to Copper End Caps

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: **Status indicator**

Things you will need:

- 1) Green Scotch Brite (use the sheet from which small cut out sections have been used before. That sheet came from PSI. I have also made a black mark (dot) on that sheet using a sharpie.)
- 2) Copper end caps and Kapton cylinder
- 3) Kim wipes
- 4) Isopropanol
- 5) Gloves
- 6) Stycast 1266 Part A and B, a plastic cup
- 7) Eye dropper
- 8) Spoon
- 9) Acid brush (cut hair length to half of original for easier glue application)
- 9) Tooth pick with one blunt end
- 10) Level
- 11) Weighing scale
- 12) Log book

Procedure:

Keep a log of everything:

-wait time between preparing the glue and using it on the end caps, if different from the standard time interval of 1 hour,

-which cylinder you are gluing (which date the cylinder was made, from which Kapton roll or batch was it made, its thickness, did it have any defect (such as holes, big air pockets, wrinkles etc),

-the type of target cell you are making (test cell or LH2 cell, target ladder number for LH2 cell),

-Any other feature worth recording.

Keep the work station clean and wear gloves at all times.

Prepare stycast mix: Take about 3 g stycast 1266 Part A in a plastic cup using a plastic spoon and a weighing scale. Add part B using an eye dropper. The ratio is $B/A = 0.28$. **DO NOT** heat the glue. Keep aside for 1 hour so that the glue thickens. During this wait period, prepare the end caps for gluing (see the next 8 steps).

Important: the glue should not be disturbed after 1.5 hours because it will affect its integrity. Please start gluing the end caps to the Kapton cylinder after 1 hour but finish gluing before 1.5 hours from the time the glue mixture was prepared.

Glue the blank end cap first. Glue the second end cap to the Kapton cylinder at least 6 hours after gluing the first one. The procedure written below describes how to glue the cylinder to the end caps.

Clean the lip of the end cap. If there is any glue residue, use a torch and apply heat directly on it to soften it. Then, use the blunt side of a file to slowly remove the charred residue.

Sand blast the lip. Set the pressure of the jet of sand to 45 psi. When sand blasting, keep the nozzle about 0.5 m away from the lip. Use compressed nitrogen to blow off any residual sand on the lip.

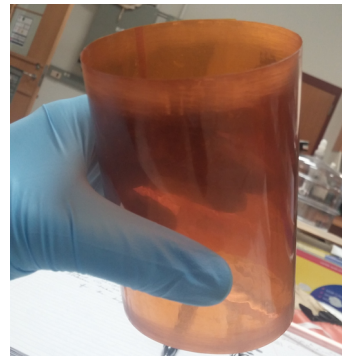
Note: When sandblasting the lip of the end cap attached to the target ladder, make sure that nothing hits the ladder and messes up its alignment. Please handle it carefully.

Use a small piece of **PSI's green Scotch Brite** to roughen the lip of the end cap. The strokes with the green Scotch Brite should be along the curvature of the lip, not perpendicular to it.

VERY IMPORTANT: Use only PSI's green Scotch Brite. Its grade (coarseness) is different from the other green Scotch Brite sheets that we have in the lab. You can identify this particular Scotch Brite by looking for a black dot on it (I marked it with a sharpie). Additionally, you will notice that the sheet has small cut out sections due to previous usage.

Clean the lip with isopropanol and kim wipe to remove any residual dust on it.

Take a 3 times wrapped Kapton cylinder. Roughen the **inner and outer** surfaces of the cell, starting from the circular edge up to 1 cm away from the edge. Do this at the top as well as bottom edges using the **green Scotch Brite**. It is important to keep the strokes parallel to the circular edge of the cell. See the picture shown below.



Clean the roughened surfaces of the cylinder using isopropanol and kim wipe.

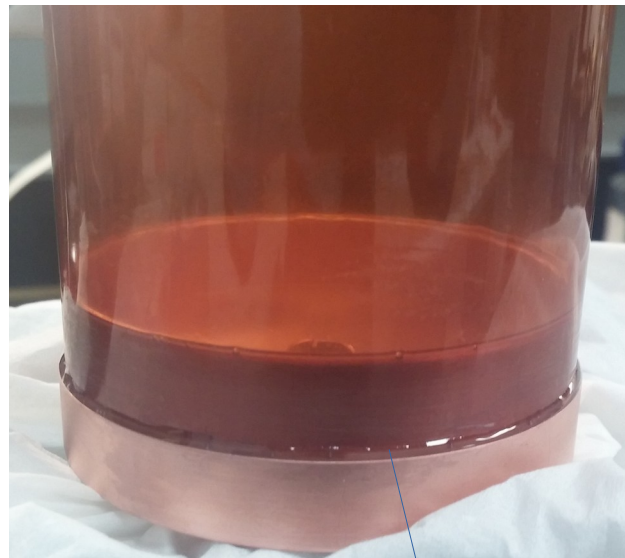
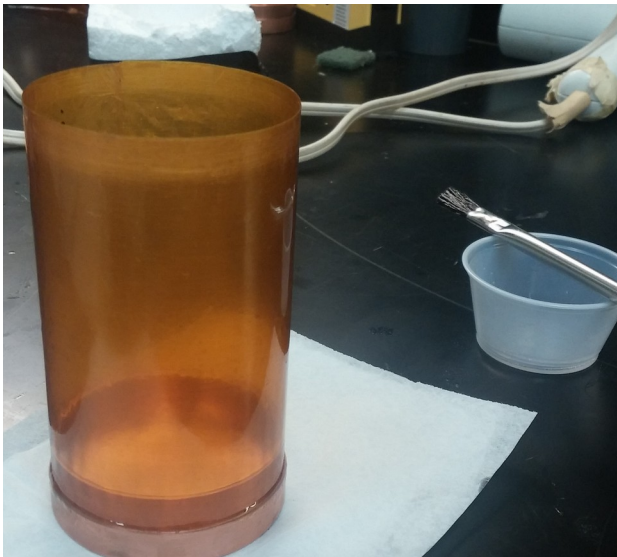
Keep the blank end cap on the table (or clamp to the table, if it is not a blank end cap) such the the lip faces upwards and the circular face is perfectly horizontal. Use a level to do so.

After 1 hour from the time the glue was prepared, apply a **VERY THIN LAYER** of glue (just enough to fill the ~ 2 mil gap between end cap and the Kapton cylinder) to the lip using an

acid brush (hair length cut to half of the original length). Apply the glue uniformly everywhere on the lip.

VERY IMPORTANT: it is difficult to quantify how thin should the layer be (a rough estimate comes with practice), but it must be noted that thicker layers of glue are more prone to developing cracks upon cooling the target cell.

- Also apply a **VERY THIN LAYER** of glue on the roughened surface of the kapton cell uniformly without leaving any empty region on that surface.
- Carefully and evenly place the roughened edge of the cylinder over the lip of the end cap and let it sit on the end cap. A lot of glue will come out leading to the formation of a ring of glue at the end of the circular edge of the cell. **DO NOT remove** that glue. Only remove any extra glue, using kim wipes, that drips below the copper lip onto the heavy copper mass.
- Very important:** there should not be any air bubble in the glue between the cylinder and the copper lip. Use a flash light to carefully look for them and push them out using the blunt side of a tooth pick. You may push them out through the edge of the cell or through the open end of the copper lip.
- Leave the cylinder + end cap undisturbed for at least 6 hours. Then, repeat the above steps to glue the Kapton cylinder to the second end cap.



Ring of glue