

# **Procedures for Aluminization of Large Telescope Mirrors using the 108" Bell Jar**

Scott W. Teare, Electrical Engineering Department, New Mexico Tech

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## **3.0 Vacuum Chamber Procedures:**

### ***3.1 Burn-in of Filaments (validated 07/10/2000)***

Purpose is to remove any contamination from the filaments prior to the melt-in process.

- Filaments are installed but not loaded with aluminum.
- Chamber is closed and evacuated to approximately  $2 \times 10^{-5}$  torr.
- Each knife switch is closed in turn while the current is run through them.
- The cold resistance is about 0.2 ohms providing an inrush current of  $10/0.2 = 50$  amps per filament as the metal heats this stabilizes at about 55 amps per filament.
- Filaments should be allowed to reach white hot and burned for 20 seconds.

### ***3.2 Melt-in of Filaments (validated 06/26/2000)***

With the filaments loaded, 4 aluminum loops per filament, a melt-in is performed to prevent the aluminum from falling off onto the work below. The procedure and expected events for the process are outlined below:

- Connect electrical supplies to the system.
- Connect the ammeter around the correct feeds to the knife switches.
- For getters, use the 150A scale, for deposition filaments use the 600A
- With the power on, turn up the variac to the melt-in position (take about 5 seconds through range of motion)
- For deposition filaments (4 filaments per knife switch) the current will rise to about 350-380A.
- The current will then fall back briefly to about 240A, climb to about 280A then start to fall off.
- Kill the current when the current falls about 20A from this highest value (ie to 260A in the case above).
- For the getters these values will be about half the above listed values.

***3.3 Deposition of Aluminum Charged Filaments (validated 07/14/2000)*** With the work in place and the chamber pumped down to best vacuum. This takes place after a low temperature plasma scrubbing of the work inside of the aluminization chamber.

- Fire each getter pair individually, waiting for the gettering effect to be seen on meters
- Set knife switches to engage all filaments to be used in deposition
- Monitor current of a single filament grouping using current transformer.

- Raise power to filaments slowly (take 10 seconds to reach 10V)
- Hold power till current starts to fall from it high value back to about 55amps per filament.
- Shutdown deposition at this point.

## **4.0 Procedures for Chemical Processing of the Mirror Substrate**

### ***4.1 Removing Old Coating (validated 07/14/2000)***

- Place mirror so that water and acids can be easily removed from the mirror, for monolithic mirrors this can require the mirror to be tilted.
- Rinse the surface of the mirror with running tap water.
- Soap the mirror surface and rinse off several times.
- Soap mirror and use bare hands to remove and grit with a light touch then rinse well.
- Place a piece of cotton on the mirror and cover with acid.
- Wipe acid around with cotton taking care to replace cotton often as Cu metal precipitates out of the solution.
- Continue to use the acid wash till all the old coating has been removed.
- Ensure sides are clean and free of foreign materials.

### ***4.2 Cleaning the Glass Surface (validated 07/14/2000)***

- Wash the surface of the mirror with acid to clean the surface until the glass squeaks under light pressure.
- Test quality of the mirror cleaning by flooding the surface with tap water and watch to make sure the entire surface wets.
- Use KOH on stubborn areas that don't wet uniformly.
- When mirror is perfect use a final acid wash and then flood with distilled water.

### ***4.3 Polishing Glass Surface (validated 07/14/2000)***

- Wet mirror surface with distilled water, sprinkle Calcium Carbonate powder over the surface and mix into a slurry with cotton batten.
- Scrub mirror with the cotton batten and slurry.
- Rinse with distilled water and repeat the Calcium Carbonate treatment several times.
- Use a distilled water soaked Lint Free towel to scrub the surface to remove the Calcium Carbonate residue. Scrub hard and repeat this several times rinsing between.

### ***4.4 Drying Glass Surface (validated 07/14/2000)***

- Place a lint free towel onto the wet surface holding two corners and drag water off mirror, or use dry nitrogen to blow water off mirror.
- When surface is nearly dry use several lint free towels in hand to buff the surface dry.