

SMITHSONIAN ASTROPHYSICAL OBSERVATORY

60 Garden Street, Cambridge, MA 02138



To: Emilio Falco
From: J. Zajac
Re: Bonding Invar to Glass
Date: 19 July 2012

This memo documents the surface preparation for bonding metal to glass.

Materials List

- 400 Grit Sanding Cloth (McMaster #4687A145)
- Fiberglass Brush Pen ([LINK](#))



- Acetone
- 50/50 Mix of Methanol and Acetone
- Isopropyl Alcohol
- Cloth wipers
- Cotton Q-Tips
- Vacuum
- Hysol 9313 Epoxy Mixed 40% by Weight with Siltex 44 Silica powder
(Example 10g Part A 2.5g Catalyst 5g Siltex 44)

Metal Cleaning Procedure

* Do this right before bonding to remove any surface layer oxidation.

1). Pre-clean the metal by wiping with cloth wipes moistened with acetone to remove any machine oils.

- 2). Thoroughly sand the surface of the metal with the 400 grit sanding cloth. Change the cloth several times and sand in circular and criss-cross patterns.
- 3). Vacuum off the sanding residue.
- 4). Clean the sanded surface with the wipers, first with acetone, then with isopropyl alcohol.

Glass Cleaning Procedure

* The goal is to get all the polishing compound out of the ground glass edge.

- 1). Mark with a pencil the area to be bonded.
- 2). Pre-clean the glass by wiping with the cloth wipes moistened with the 50/50 methanol/acetone solution.
- 3). Using the fiberglass brush moistened with the 50/50 methanol/acetone solution and moderate pressure, remove all polishing residue from the marked bond area. Repeat this step several times wiping with the 50/50 solution until the edge is clean.
- 4). As a final clean, use the q-tips moistened in the 50/50 solution and significant pressure. The q-tips should be clean at this point or more fiberglass brush work is necessary.

Bonding

The Hysol 9313 mixed with Siltex 44 Silica powder will have a tendency to run in the gravity direction. We have found that letting the epoxy sit for about 25 minutes increases the viscosity and minimizes this effect. The bond gap should be 0.010 inches. It is recommended to make a prototype set-up first to test for epoxy running out of the bond line.

Although the epoxy is mostly cured after a full 24 hours, we recommend waiting a full 7 days before loading the bond joint.

It is also recommend that a witness sample be made at the same time as the actual bonding.