

### Changing the Filament

If the power suddenly turns off and you can't charge the filament up, the filament may have broken, or it may be that there is a buildup in the cap that holds the filament. The break should be obvious.

New filaments are in the lab across the hall from the SEM.

You need

- Q tips
  - Acetone
  - isopropanol
  - gloves without powder <--- very important
  - tinfoil
  - air in a can
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### INITIAL SET-UP

Turn voltage off

Turn filament knob counterclockwise (all the way down)

Turn the evac/air switch to AIR

Lay tinfoil out on counter

Undo the four screws in picture (they should only be loose- maybe even not tightened)

### TAKING OUT FILAMENT

Tilt the head of the SEM over when the screws are loosened

Wearing the gloves, unscrew the silver cap

Put the cap on its back in the SEM so that it stays clean

Pull out the inside component that will have the filament in it

Close the SEM to avoid getting any dust inside- leave the cap that you screwed off inside

Put the filament component on the tinfoil and look at the filament. If it is not working it will probably be broken. Unscrew the filament cap (see picture)- there should be four screws.

Wearing the gloves, look at cap that you screwed off under the microscope. It should be very clean. It may be that the filament is not broken but that the cap just needs to be cleaned- a dirty cap may cause an arc at the filament and this will shut off the power. Either way, this should be very clean.

## CLEANING THE FILAMENT

To clean the cap you should get the tube of blue polish that is in the drawer behind the SEM. Use Q-tips to rub this on the cap and then polish it off. Do this a couple of times until the cap looks very clean. The spot in the center of the cap needs to be cleaned very well. This can be cleaned using the wood of a Q-tip- clean this very well.

After the polishing is done use acetone first to rinse off the excess polish. Rinse the cap 2-3 times. Then use Isopropanol to rinse three more times. Then using an air can, blow off all remaining moisture and any dust. Look at the cap under the light microscope. There cannot be any dust on the cap. This will corrupt the images. If there are any fibers remaining on the cap, use the air can some more.

To put a new filament in loosen the filament supporting screw (see picture). The filament must be lined up exactly with the notches in the housing. Tighten the screws to hold the filament down. You should try to center the filament as well as possible.

## CENTER THE FILAMENT

You can tell if the filament is centered by putting the cap back on the filament holder and looking throughout the hole on the top (see picture) using the light microscope (close one eye so that you don't bias your vision and think that the filament is off center). It will be pretty clear if the filament is centered. Use the filament centering screws to center the filament to a good position (see picture).

## HEIGHT OF THE FILAMENT

The filament should not be protruding from housing. It should be a little bit below. It is hard to tell how good it is so estimate the distance between the tip of the filament and the hole in the housing to be about .34mm. Then put the housing on top of the filament piece and tighten by hand. Then use the allen wrench and put it inside the holes on the side of the filament housing and use it as a lever to tighten the cap a little more. Then put the pieces back in the SEM and tighten the screw that you originally left in the SEM. Put the cap back down and then hit the EVAC button. (you don't have to tighten the screws- they can be loose because the screws are just there in case of moving or an earthquake).

Then with the power up, turn the power to 20kV. Turn the filament and try to get a saturation at about 80- 100 (80 is better). If the emissions are not at 80mA then you need to move the position of the filament closer to the hole (about 1/8 of a turn clockwise moved it from 60mA to about 90mA). Go through the steps above.