Protocol

Fu-Hao Chen 12/22/2014

Fabrication of small apertures (diameter of 30~40um) on 25 um-thick Teflon using the PRECISION SPARK GENERATOR.

Aim:

To fabricate an aperture on the Teflon, which is as small as possible using the PRECISION SPARK GENERATOR.

Before the formal fabrication:

A better way is taking abandoned Teflon, following the instrumentation until you get the best parameter of the arm length for the aperture size, and then use clean Teflon to repeat the fabrication to obtain the Teflon with small aperture and assemble it into the chamber.

Instructions:

1. Take the head stage with two metal electrodes on it.
2. Use tweezers to align the metal electrodes, make sure the two electrodes aim to each other, so the two electrodes are aligned into a straight line.
3. Loose the two screws which fix the two electrodes, so the two electrodes can be moved freely.
4. Measure the length of the two arms of electrodes from outside of the holder with caliper. Move each electrode until the length of each arm is 0.91 ’’, and the lengths of the two arms are equal. After the length is correct, tighten the two screws to fix the electrodes.
5. Take the PRECISION SPARK GENERATOR, and connect the red and black wires from the spark generator to the two electrodes through alligator clips. Make sure the red wire goes to the marked “R” side, and the black wire goes to the marked “B” side.
6. Cut a rectangular Teflon film, whose dimension is 2.5 cm x 2.5 cm x 25 um.
7. Squeeze the rectangular Teflon film in the cartridge holder, which are two plastic plates with an open circle in the center. Make sure the open circle is at the upper right corner of the Teflon film, so the position of the fabricated aperture would be located inside the U-shape chamber. The Teflon must fill the entire open circle; otherwise, the electric spark would leak from the unfilled place.
8. Put the cartridge holder in the gap between the two electrodes; make sure the electrodes are aiming the center of the open circle.
9. Plug in 120 V AC, and switch on the power. Tune the frequency knob to 1 Hz.

10. Stay clear from the spark generator in case of getting zapped.(Warning: The voltage is 30 kV, you must be very careful!!)
11. Push the red button until you hear a “boom”, and release the button.
12. Take out the Teflon, and observe the aperture under a microscope.
13. If the aperture is more than 40 um, you may elongate the electrodes from 0.91” to 0.92”. On the contrary, if the Teflon cannot be broken, you may move the electrodes from 0.91” to 0.9”. The trials can keep going until you are satisfied with the aperture size.
14. Once you get the aperture size you want, you can stick the Teflon in the chamber with silicone.