

Chip Assembly

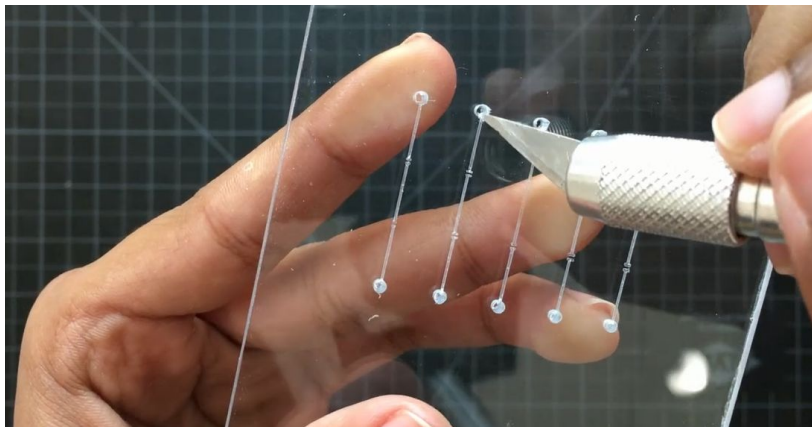
Materials Required:

- Stirring tool
- Plastic weighing dish
- Magnifying lens
- Soft toothbrush
- Rubbing alcohol
- Exacto knife
- Tapping tool
- Clamps
- Epoxy
- Plastic ports
- PEEK Tubing cut to 7/10" segments
- Kim wipes
- Binder Clips

Instructions:

Cleaning milled chip:

1. Peel the double sided tape off the chip
2. Use sandpaper to smooth the sides of the chip if needed
3. Use a soft toothbrush to brush off any polycarbonate dust left on the chip
4. Place the chip under a magnifying lens with a strong light source
5. Ensure you can clearly see the milled portions of the chip through the lens



6. Use an Exacto knife blade to clean any debris out of the channels and primitives
7. Use rubbing alcohol and a soft toothbrush to help remove the last of the debris
 - a. Note that you should only need to exert gentle pressure when doing this, using strong pressure will cause you to damage the milled primitives.

Tapping your chip:

The Control Layer:

1. Place your chip with the milled side down onto the edge of a sturdy worktop.
2. Use two clamps to secure the chip to your worktop
3. Take your tapping tool and place it inside the hole
4. Turn the tool clockwise slowly and ensure it remains in a vertical position throughout the tapping process, if it begins to lean to one side remove the tool and begin again
5. Once the tool has gone entirely through the chip, turn it counterclockwise to remove it.
6. Use a soft toothbrush to clean the polycarbonate debris off the chip and ensure there are no blockages using a magnifying lens
7. Prepare your epoxy
 - a. Prepare a plastic weighing tray to mix the epoxy in
 - b. Dispense equal amounts of each liquid from the epoxy tube
 - c. Wipe off excess epoxy from the tube and replace its lid
 - d. Mix the epoxy thoroughly with a stirring tool until it is well combined
8. Screw your ports a quarter of the way into the tapped holes
9. Use your stirring tool to spread an even layer of epoxy around the ports, if necessary add one or two more layers to ensure that the epoxy completely seals the ports

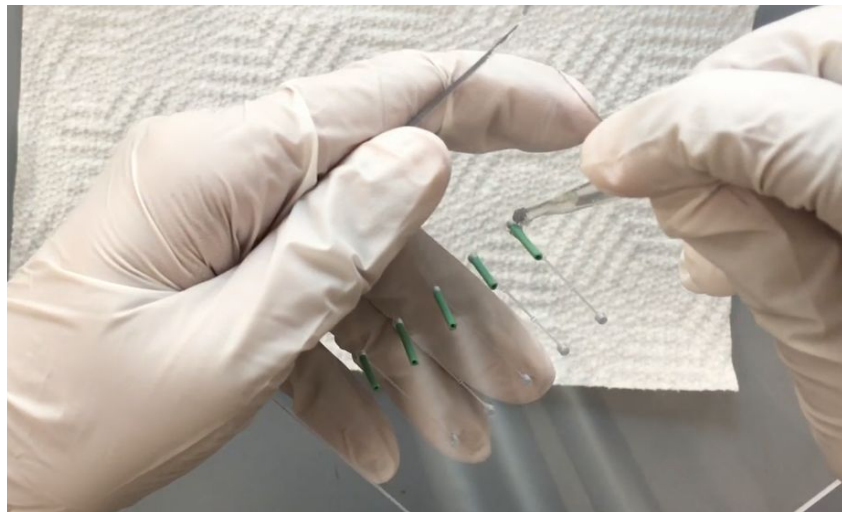


10. Screw the ports further in until they are about halfway through the chip

11. Flip the chip over and ensure the port has not been screwed entirely through the chip. Your channel should **not** be blocked by the port., if this has happens unscrew the port slightly until the channel is no longer blocked.
12. Leave the chip to dry for the instructed amount of time on the epoxy package

The Flow Layer:

1. Ensure your chip is clear of any debris from milling
2. Flip the chip layer milled-side down and gently push the PEEK tubing halfway into the ports
3. Flip the chip over and check the milled side to ensure the PEEK tubing has not gone entirely through the chip. Your channel should **not** be blocked by the port, if this has occurred gently pull the peek tubing out until the channel is no longer blocked
4. Prepare your epoxy as described above
5. Use your stirring tool to spread an even layer of epoxy around the PEEK tubing, if necessary add one or two more layers to ensure that the epoxy has completely sealed the PEEK tubing



6. Leave the chip to dry for the instructed amount of time on the epoxy package

Preparing the Polycarbonate Layers:

1. Begin by spraying the polycarbonate flow and control layers with rubbing alcohol. Wipe down with kim wipes
2. If you notice any dirt or debris located on the surface or inside of the etchings on either your control or flow layers, use a soft toothbrush and more rubbing alcohol to clean the chip

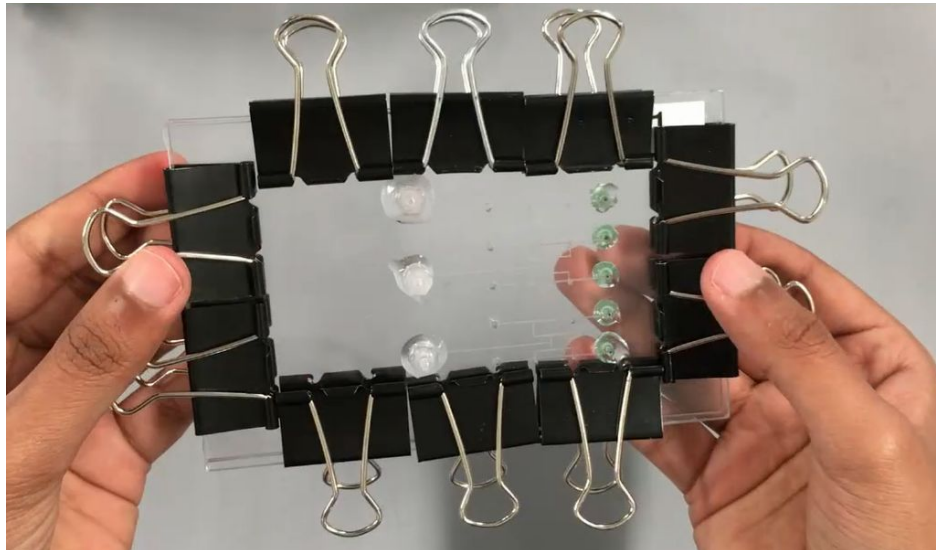
3. Use compressed air to dry the chip layers and lay them milled side up on clean paper towels

Preparing your PDMS Layer:

1. Use a soft toothbrush and rubbing alcohol to clean the pdms if there are large pieces of dirt and debris adhered to it
2. To keep the PDMS clean during this procedure, lay it on a kimwipe and do not touch it with your bare hands

Assembling your Layers:

1. Place your clean PDMS layer on the milled side of your flow layer
2. Use a fresh kimwipe to smooth out any air bubbles that form under the PDMS
3. Spray rubbing alcohol on the “bare” side of the PDMS, use a fresh kimwipe to wipe off the excess liquid and use compressed air to dry it fully
4. Align the primitives on your control layer and flow layer, then press down to sandwich the PDMS between them
 - a. It is vital that your flow valves and their corresponding control chambers line up properly. If they do not your valves may not open properly
5. Attach binder clips around the periphery of the chip
 - a. Ensure that they are equally spaced along each side of the chip
 - b. And that there are minimal or no gaps between the clips in order to ensure a good seal



Desiccating your Chips:

1. Place your chip inside the desiccator and close the valve
2. Turn the desiccator on and leave the chip inside for at least 15-20 minutes
 - a. Larger chips may require a longer time in the desiccator in order to form a strong seal
 - b. Longer desiccation times also yields a stronger seal on your chip
 - c. Once formed, the seal on a chip can last up to 24 hours
3. Turn off the desiccator without opening the valve and leave the chip inside for 10-20 minutes more
4. Open the valve slightly to slowly release the vacuum. Opening the valve too much or too quickly can lead to your seal being compromised.,
5. Remove your chip from the desiccator

Your chip is now ready to be tested