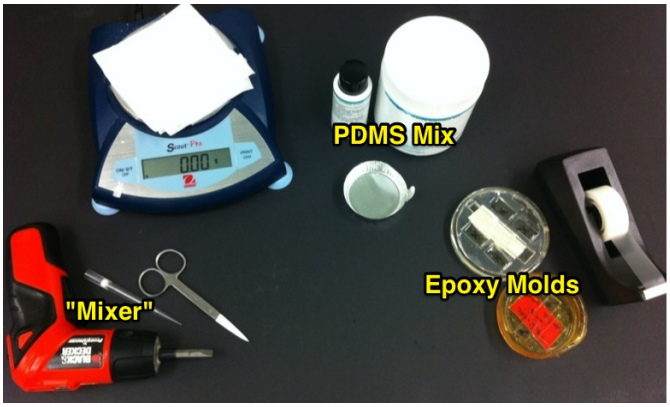
Jun Lab Protocol Making PDMS Devices
JT Sauls July 2017

Part 1: Mixing, pouring, and baking PDMS

Materials

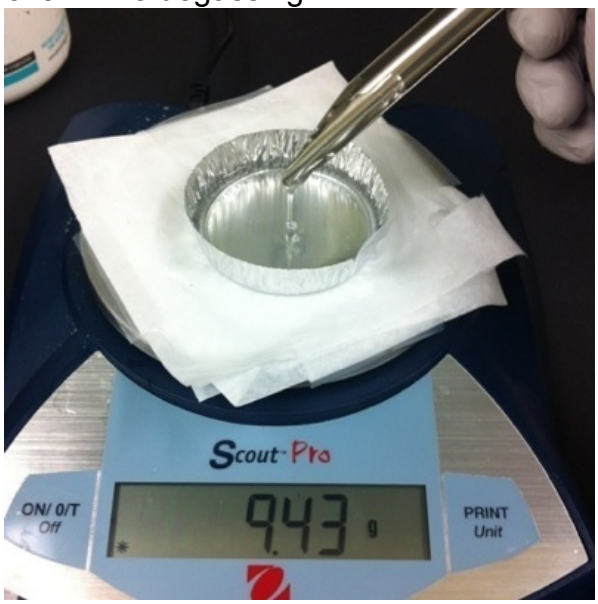
- Epoxy mold
- Sylgard 184 silicone elastomer base and cross-linker
- Scale and weigh dish
- Power drill, 1ml pipet tip, and scissors (to make mixer)
- Vacuum chamber
- Oven (60-75C)
- Tape (for cleaning epoxy)
- Timer



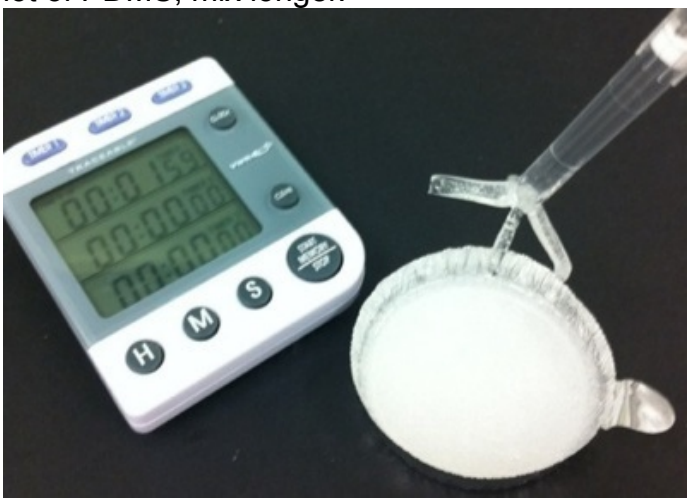
Protocol

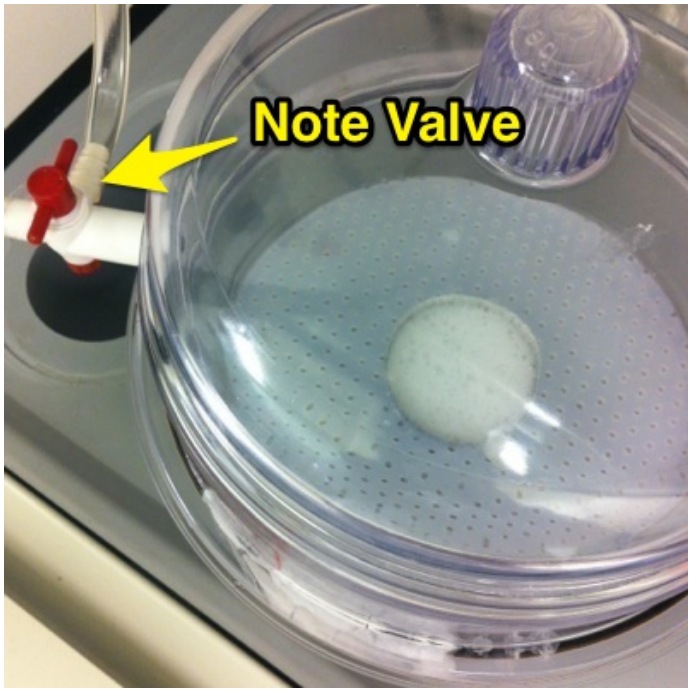
1. Make the mixer. Cut off the end of the pipet tip, then create four slits from this opening ~1.5cm down the length of the tip. Fold the blades back so it looks like a little propeller, and stick the other end into the drill bit on the power drill.

2. Pour the PDMS. We use a **10:1** (g:g) base to cross linker ratio. Tare a weigh dish on the scale and pour the base, then tare again and pour the cross-linker. It helps to pour from the bottle onto a scoopula instead of directly into the dish in order to not overshoot. Weigh out enough for your epoxy, and use an appropriately sized weigh dish. The weigh dish pictured can only be filled with about 10g of PDMS, lest it bubbles over while degassing.



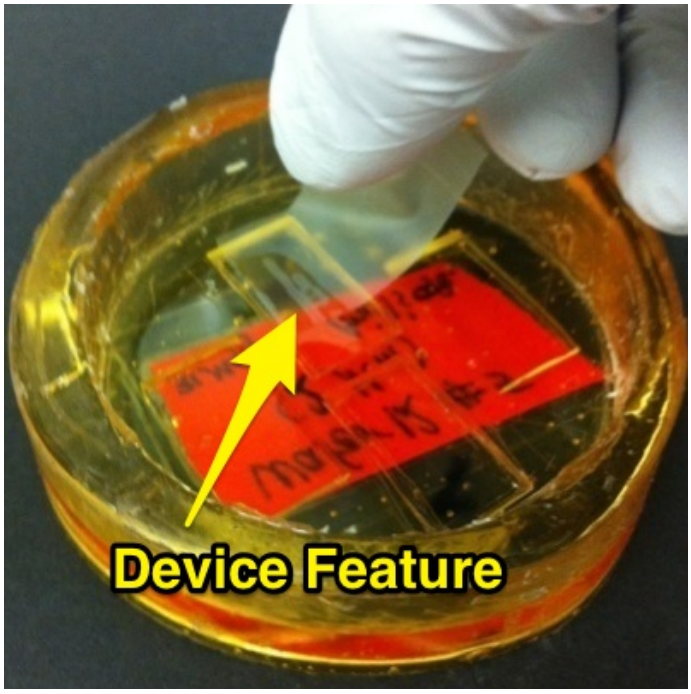
3. Mix up the PDMS. Just stick the home-made mixer into the dish and vigorously mix the PDMS for at least **2min**. If you are mixing up a lot of PDMS, mix longer.

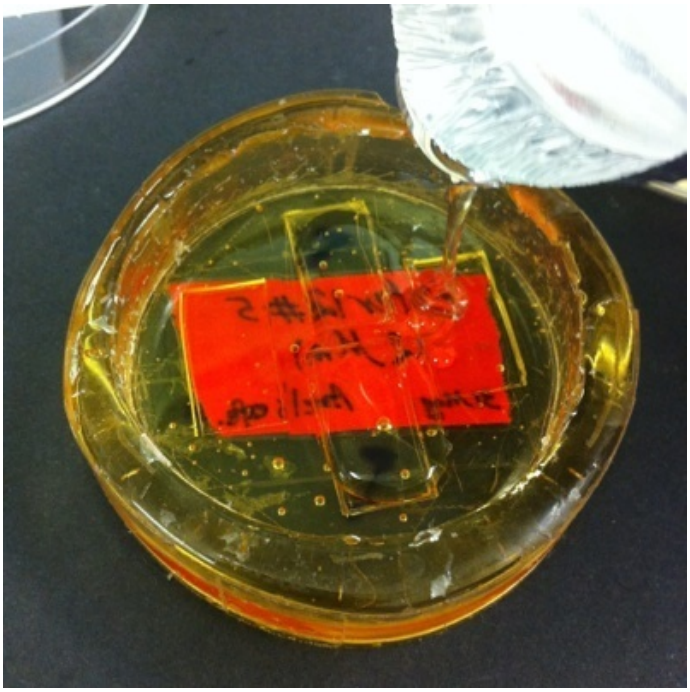




4. De-gas. All that mixing is good for the PDMS reaction but we can't have bubbles in the final device. Put the dish in the vacuum chamber, hook up the vacuum line, and turn it up (you know your creating a vacuum if you can no longer open the chamber). The mixture will start to foam as the air escapes, and you may need to let air in to prevent it from spilling over. Let it de-gas for **40min** or until there are no visible bubbles.

5. Pour the mold. Take your degassed PDMS (it should be totally clear with no bubbles) and pour it evenly into the epoxy mold. It's a good idea to clean the part of the mold where the device features are with tape to ensure no dirt or dust makes it into your device. You can also blow the the epoxy off with the filtered air hose or use an little ethanol to clean it. Be careful however not to damage the features with excessive force.





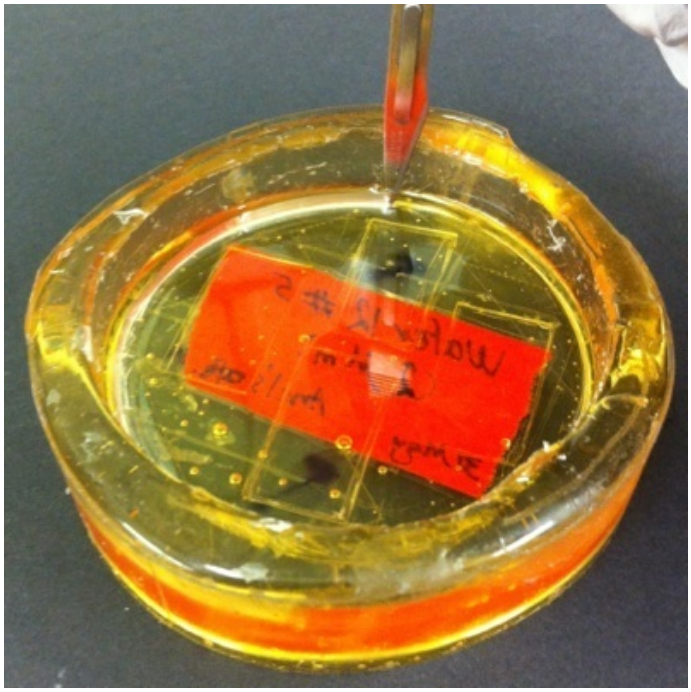
6. De-gas the mold. Same as before, but **10min** is enough this time as long as you see no bubbles.

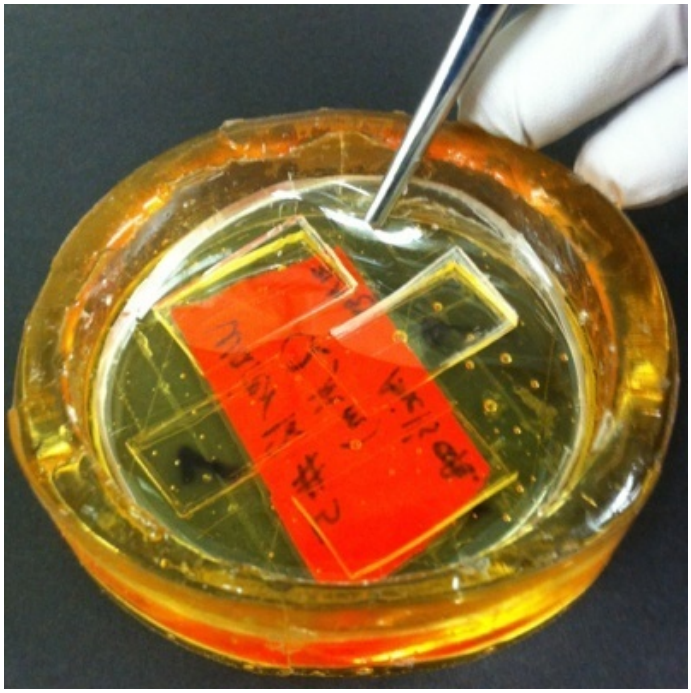
7. Bake your devices. Put your entire epoxy mold into the oven and bake **8hrs (overnight is fine) at 65C**. Hotter also works.

Part 2: Recovering and cleaning you PDMS device

Materials

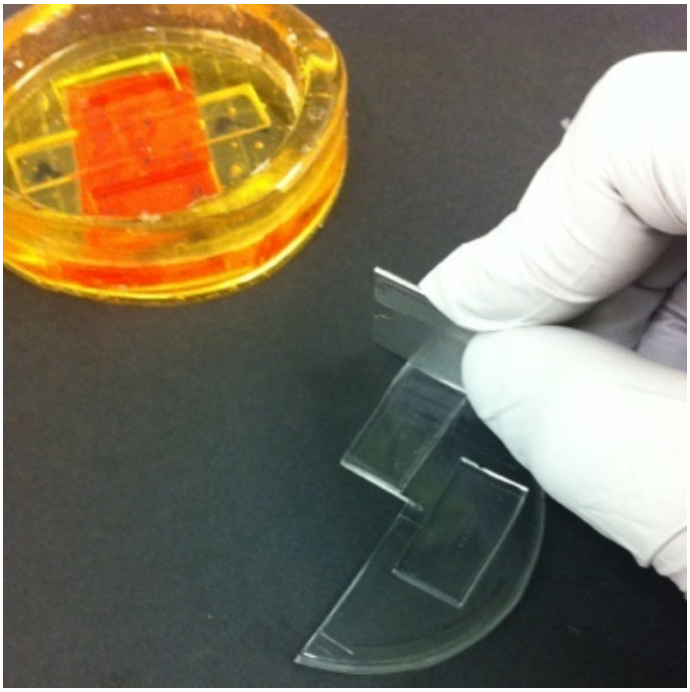
- Your PDMS devices from Part 1
- Scalpel and tweezers
- Hole punch
- Pentane and acetone (and protective equipment!)
- 1L beaker, stir plate, stir bar, and aluminum foil
- Scotch tape
- Test tube rack and kimwipes (for drying)
- Petri dish (for storage)

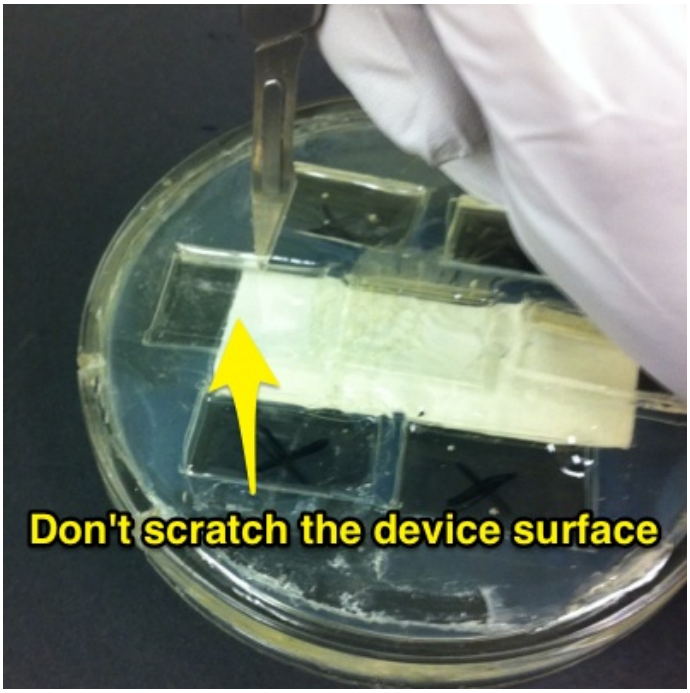




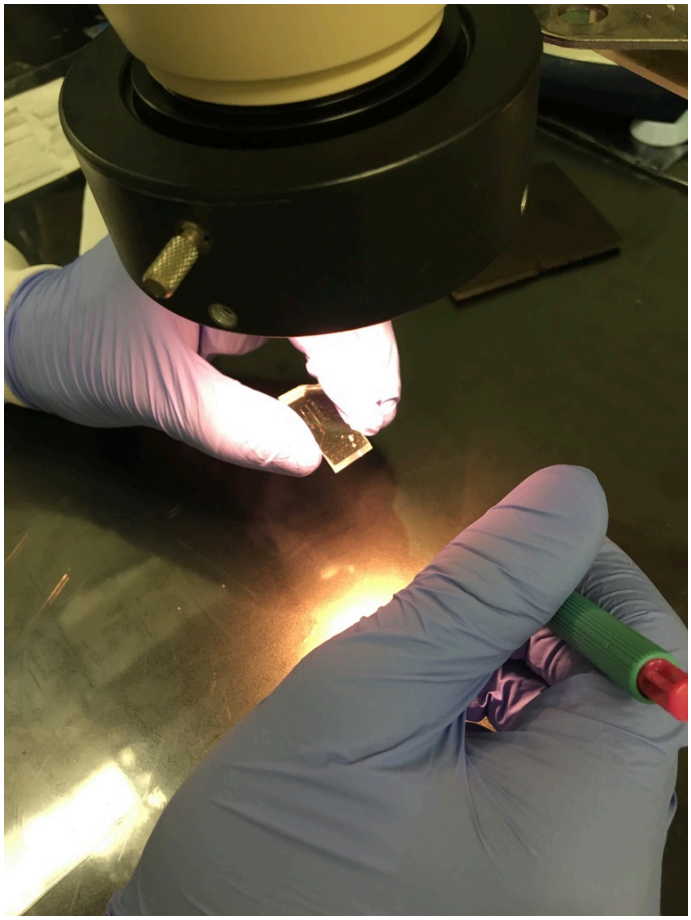
Protocol

1. Remove your PDMS devices from the mold. Use a scalpel or razor blade to cut around the edge of the of the mold and peel out the PDMS with the tweezers. It's best if the PDMS comes out all at once and without rips. Avoid cutting the actual device surface. Trim off all the excess parts and clean the devices with tape to remove any dust that may have grabbed onto them. If the PDMS is not coming out well, get up an edge and squirt some ethanol beneath the PDMS and the epoxy, which will help disrupt Van der Waals attraction.

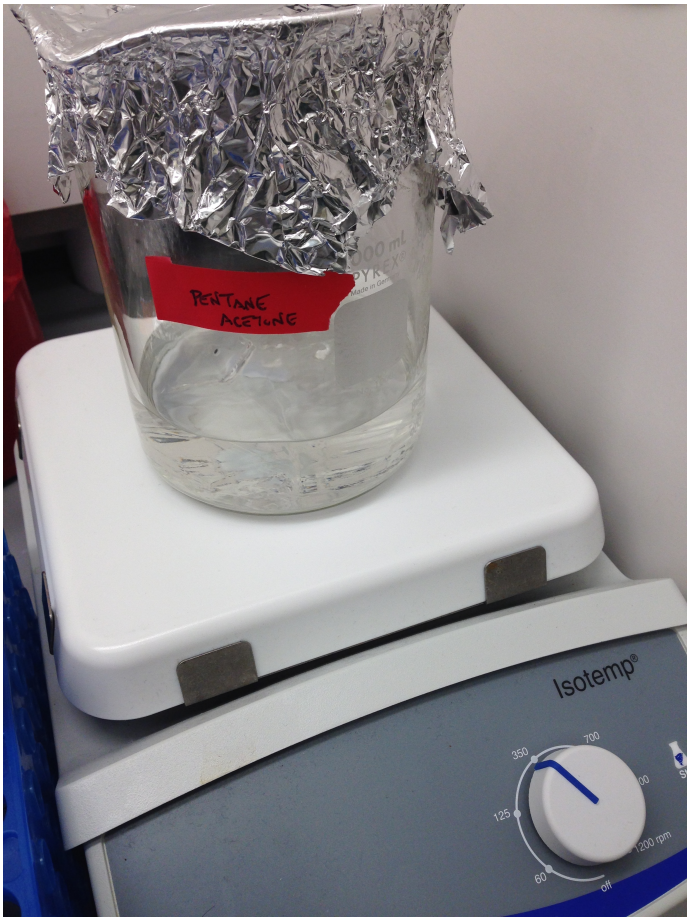




2. Optional but highly recommended step. If you know what kind of tubing you will eventually be using with these mother machine devices, go ahead and punch inlet and outlet holes for each device. Use the stereoscope and punch the holes at the very ends of the main trench (Otherwise, cells can grow into a microcolony in the dead volume). Punching now will help small PDMS fragments get cleaned out, avoiding clogging later on.



3. Wash with pentane. This and the rest of the steps should be done in the hood as pentane is a serious solvent and acetone isn't much better! Use your PPE! First put all the devices around the edge of the beaker, put a stir bar in the middle, and put the beaker on the stir plate. Pour in **200mL** pentane, or enough to cover the devices. Turn on the stir plate and cover the beaker with aluminum foil lest all the pentane evaporate. Let stir for **2hrs**. Cover tightly with foil or the pentane will evaporate.



4. Wash with acetone. Using the funnel pour out the spent pentane into the waste beaker without loosing your devices or stir bar. Pour in **<u>200mL</u>** acetone same as with the pentane, cover up, and let stir for 1 hour. Longer is fine.

5. Repeat Step 4 two more times. So in the end there is one washing step with pentane and three with acetone, a five hour process.

6. Dry the devices. After removing the last of the acetone, tape some clean room clothes to a test tube rack and lay the devices on the cloths feature side up. Let them dry, they can sit out overnight in the hood. After they are dry, store them in a clean petri dish.