

## Casting PDMS

When we cast microfluidic devices in PDMS, we are dealing with structures that have very small feature sizes. In this class, the feature sizes are on the order of 25-50 micrometers, but many microfluidic devices have even smaller features. To ensure that our devices have the correct structures, it is important to have a thoroughly clean master. The first step in this process is washing the master. After getting the master wet, it should be cleaned with soap and then rinsed in tap water (note: this applies to the plastic masters only; silicon masters must be treated more gently).



After washing the master, it should go through several rinse stages. First, rinse it with deionized (DI) water. This removes residue left behind by the tap water.



Next, it should be rinsed with isopropyl alcohol. This step picks up oils and other debris that can affect the casting.



The master should then quickly be dried with pressurized air, either from an air canister as shown here or from a central air pump.



Finally, the dry master should be placed on a flat surface and covered with packing tape. Make sure not to touch the sticky side of the tape before it contacts the master! The packing tape picks up any dust, PDMS, or other residue that is still stuck to the master. Make sure to press down on the tape to make sure it contacts the important parts of the master (i.e., where the channels are). Lift off the tape when you're ready to pour the PDMS.



When pouring PDMS, it is important to try to minimize the formation of air bubbles. If you have too many air bubbles, you may need to de-gas the master before baking the PDMS. One way to minimize the formation of air bubbles is to pour the PDMS as close to the master as possible. The image below shows an example of how to pour. The PDMS should flow out of the cup onto the device, rather than drop.



When you are done pouring, the entire device should be covered in PDMS, as shown below.



After the PDMS is poured, carefully place the master into the oven. Be careful not to spill any PDMS while you are moving the master! The image below shows what you should **NOT** do: do not place the master directly on the cooking rack! Instead, place it in a secondary container, such as a teflon pan. That way, any PDMS that spills out of the master will be caught by the pan.



The PDMS needs to bake for at least an hour before it is hardened. Preferably it should bake for two hours or more. The oven should be set to 150 degrees F, on convection mode. The image below shows the proper oven settings for a one-hour bake.

