

Casting Masters

Masters for casting microfluidic channels are typically made from thin silicon wafers, and are quite fragile. Moreover, masters tend to lose their patterns over time, and are difficult to modify to make variations on a single design. Here we demonstrate a technique for using an existing master to create a new master out of plastic. This new master is sturdy and can be easily modified (e.g., with wax or modeling clay). Moreover, multiple plastic masters can be made from a single silicon master, allowing each group of students in the class to have their own master.

The first step is to use the silicon master to cast a PDMS device such as the one shown below (link goes to larger image). In this case, metal cylinders were used during casting to create holes for inserting the plastic cylinders.



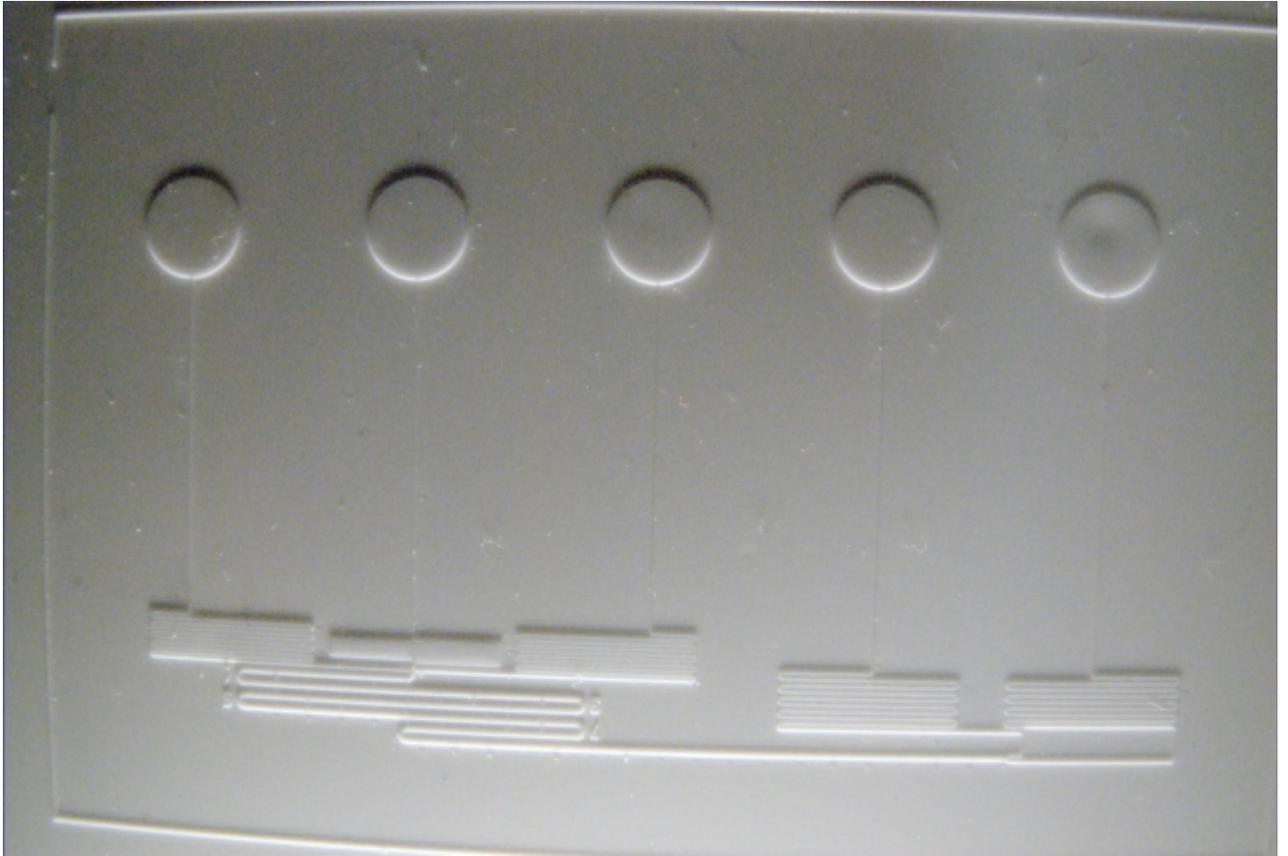
Rather than bonding the device to a glass slide as shown in the above image, though, the device is placed in the bottom of a plastic tray channel-side up. A quick-hardening plastic is poured over the device and allowed to solidify. The plastic takes the complementary shape to the device; that is, it becomes a new master. The plastic can easily be separated

from the PDMS device; however, it is more difficult to separate it from the other plastic, so a separate plastic container typically has to be used for each cast.



The resulting master is sturdy, can be used many times without loss of resolution, and can easily be modified. The images below show two variations of a single design, one which creates holes for inserting plastic cylinders and one which does not.

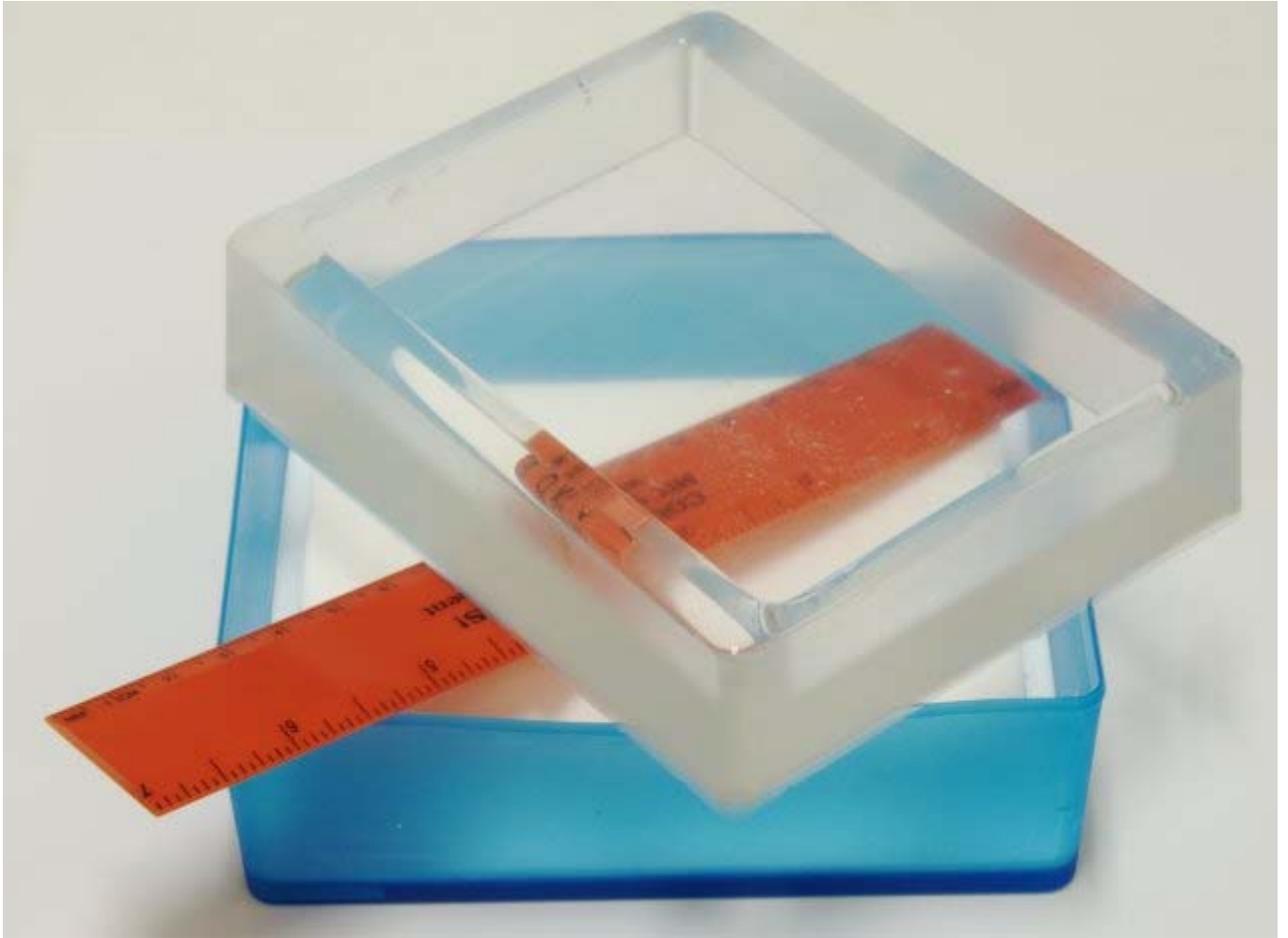




A slightly different technique is shown below. First, a small (roughly 5" x 3") container is filled with white plastic and allowed to harden. This plastic is then placed in the center of a larger container, such as the blue one shown below. More white plastic is poured around the existing cast, but to a lower level, so that a mold like the one shown below is created.



This mold is then used to create a PDMS container, such as the one shown below. The plastic mold can be saved and used to make a large number of PDMS casts.



Finally, a microfluidic channel can be placed in the center of the PDMS container, channel-side up. Plastic can then be poured into the container and allowed to harden. The resulting plastic mold can then be used to cast a large number of PDMS devices identical to the one placed into the center of the container. Also, since the plastic and PDMS are easily separable, the PDMS device and container can be used to make multiple plastic masters.

