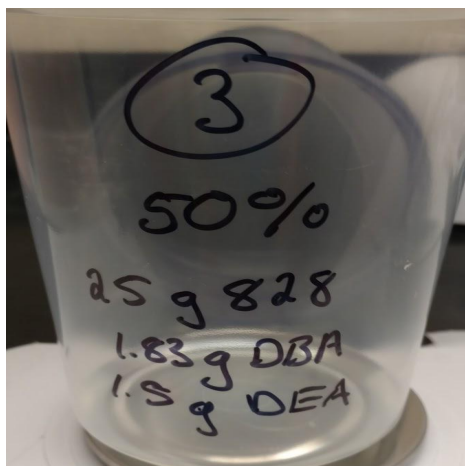


3. Set up the syringe rack next to the workspace.
4. Turn on and light Bunsen burner.
5. Carefully melt the needle adapter of the syringe (the tip where liquid would be pushed out) by holding it over the flame. Let gravity help you seal the opening by rotating the syringe on its side. Take caution during this step: you should not ignite the plastic, just heat it enough to liquify it. **Note: The open flame must be used away from the chemicals used for batching – Particularly DBA which is flammable.**
6. Place the freshly sealed syringe tip-down in the rack to cool.
7. Repeat steps 5 and 6 until all syringes have been sealed.
8. Turn off the Bunsen Burner and put it away.
9. Allow each syringe to cool for several minutes.
10. Using the plunger you saved earlier, attempt to push air through the cooled syringes. If properly sealed, the plunger should resist the motion, and should slide backwards once released. If the syringe does not pass this test, repeat steps 5 and 6.

## II. Set up mixing workspace.

11. Prepare workspace inside the fume hood by laying out paper towels around the balance and plugging the balance into the wall outlet. Check the bubble level to make sure the balance is level, and adjust as necessary. The rack holding the sealed syringes should be nearby and readily available.
12. Take out popsicle sticks and pipettes. Label each for what chemical they will be handling with colored electrical tape, using a consistent labeling system (DBA:blue, DEA:green, 828: White).

13. Label a plastic container with the proportions of your batch. **Note: All materials that come in contact with the epoxy/hardener mixture must be cured in the oven for 24 hours before going into the trash (after this period, the resin is fully cured and is no longer hazardous)**



*Plastic epoxy mixing container, labeled with batch proportions.*

Mixing Chemicals:

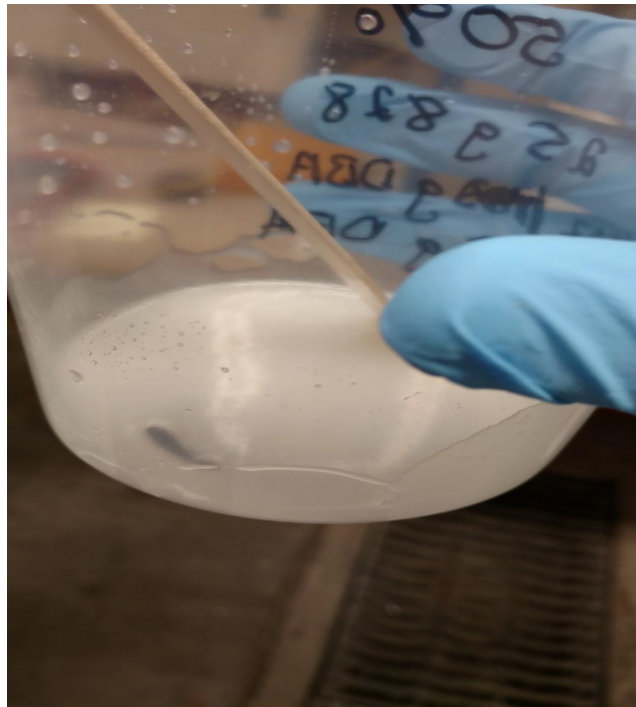
1. Begin by positioning your plastic container on the balance in the fume hood. Tare by pressing the “zero” button.



*Tared Scale*

2. Take the 828 out of the oven and carefully pour it into the plastic container. As you get closer to your desired figure, use the designated 828 pipette to add the resin at a more controlled rate. Try your best to get within 0.01g of the target mass. Put the 828 back in the oven when you are done with it.
3. Tare the scale again, and add the appropriate amount of DEA using its designated pipette. Again, try to get within 0.01g of the target mass. Put the DEA back in the oven when you are done using it. **Note: From here you will be handling DBA. DBA should not be inhaled as it can produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. (DBA has a fishy odor).**
4. Tare the scale and add the appropriate amount of DBA using the designated DBA pipette. Try to get within 0.01g of the target mass. Carefully seal and store the DBA bottle when you are finished using it.

5. Set a timer for five minutes. Carefully stir the epoxy mixture with a popsicle stick for the duration of this period. Keep the container under the fume hood at all times while stirring, and point the opening away from you to minimize exposure to fumes. The mixture should turn from clear to opaque after five minutes of stirring.
6. Place the mixture in the 70°C oven for five minutes. Take out and stir, checking to see if the mixture has reverted from opaque to clear; if not, place in the oven for another five minutes. Repeat this process until mixture is clear.



*This mixture, still slightly opaque, could use more time in the oven.*

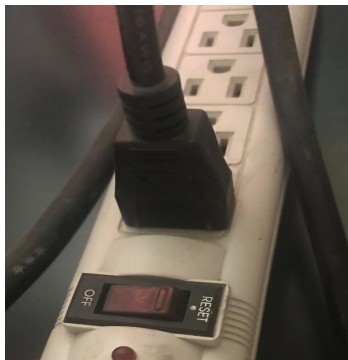
#### Degassing:

1. Place the mixture in the pressure chamber, and close the chamber door securely. Turn on the pump using the switch located on the lower right side of the pressure chamber.



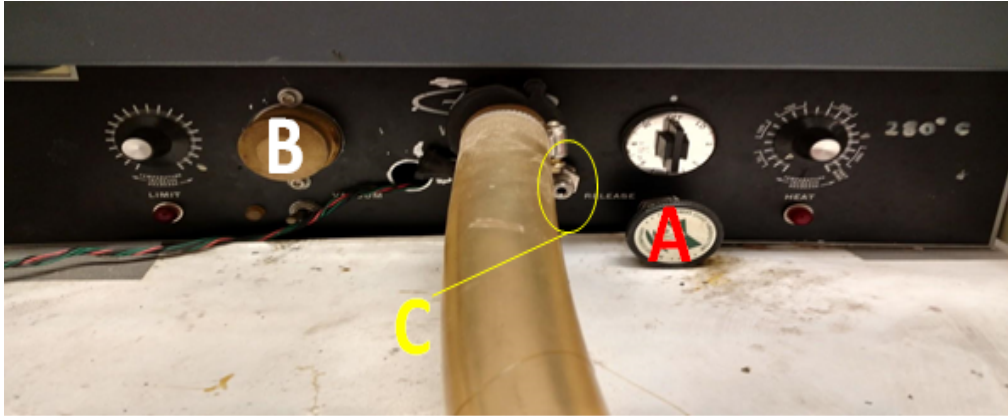
*Pump switch on side of pressure chamber*

2. Next, turn on the power strip to the left of the pressure chamber. It should be beneath the neighboring oven.



*The power strip in the off position*

3. Turn the release valve (A) (see picture below) to the right as tight as possible. If the valve is not sealed, air will enter the chamber and you will hear a whistling sound.



*The vacuum chamber's different mechanisms*

4. Switch on the vacuum toggle (C). Begin to turn the pressure valve (B) to the left. This will start dropping the pressure. Unlike the release valve, you generally do not want to turn this knob to the tightest possible level.
5. Once a satisfactory pressure has been attained in the chamber, set a timer for five minutes. Keep an eye out for overboiling in your mixture: miniscule, quickly rising bubbles are quite normal, but larger bubbles are a bad sign. Feel free to adjust the pressure in the chamber as needed using the two valve knobs.
6. If after five minutes the mixture seems adequately degassed (that is, if the bubbling has significantly slowed), you may equalize the pressure in the chamber. Simultaneously open the release valve and close the pressure valve, and wait until the chamber reaches equilibrium to open the vacuum door.

#### Pouring and Cure:

1. Place your degassed mixture along with your sealed syringes+syringe rack under the fume hood.
2. Bend the lip of the mixture container into a spout shape.

3. Hold the opening of the syringe to the makeshift spout so that the sides of the two containers are near parallel. The quality of this configuration is what will determine how much air is incorporated back into the mixture during the pouring process, so line this up carefully. **Note: The goal of degassing is to remove air from the samples and decrease inconsistencies. Thus it is of utmost importance that while pouring the degassed epoxy into our molds, no air is re-incorporated into the mixture.**
4. Slowly pour the mixture down the side of the syringe. Fill the syringe up to at most a centimeter from the top. Overfilling the syringe can make the epoxy removal process difficult, while underfilling can lead to wasted epoxy when it comes time to cut samples for testing.
5. Carefully place the filled syringe back onto the rack.
6. Repeat steps 3-5 until you run out of epoxy. Seal and cool extra syringes if needed; no epoxy should go to waste.
7. Place the rack of filled syringes inside the oven. Cure for the desired time. **Note: The cure time is usually in the magnitude of several hours, but should nonetheless be handled with precision; as such, make sure that either you or another qualified lab assistant will be there to take out the epoxy cylinders exactly when specified.**

### Cleanup

1. Any trash that has come in contact with any of the chemicals should be stored in the mixing container and cured in the 70°C oven for twenty-four hours. It is only after this curing period that the trash can be disposed of.



*Trash in the curing oven*

2. Wipe your work surfaces with acetone and paper towels.



*Acetone and paper towels*

3. Put your lab coat and safety glasses back in 130B.
4. Wash your hands for at least a minute to ensure no chemicals linger on your skin.



### Recovering Cylinders:

1. Suit up with proper PPE. Safety glasses, thick heat gloves (located in the drawers of 130C), and closed-toe shoes are a must for this step. Wearing a lab coat is recommended.
2. Lay out all necessary tools for this process- hammer, pliers, ziploc baggies, and sharpie. The first two can be found in the 130C toolbox, and the last two on the counter in 130B.
3. Using the heat gloves, take the rack of cured epoxy cylinders out of the oven.
4. While still wearing heat gloves (which will protect you from both the heat of the epoxy and the potential impact of the hammer) begin hammering at the sealed tip of a syringe with firm but controlled taps. The objective is not to crush the syringe tip, but rather to knock the epoxy cylinder down the length of the syringe. Aim to get the cylinder down at least a centimeter before proceeding with the pliers. **Note: Hammering the syringes can send sharp plastic debris into the air. Be sure to wear your safety glasses to prevent injury.**
5. Using the pliers, pinch the newly empty tip of the syringe in order to push the epoxy cylinder further out. Continue with this pinching action down the length of the syringe until a good portion of the epoxy protrudes from the syringe, at which point you can simply use your hands to completely pull the cylinder out.
6. Repeat steps 4 and 5 until all epoxy cylinders have been extracted.
7. Store the cylinders in baggies labeled with the material, the appropriate batching number, and (if necessary) the cure schedule.
8. Throw away the syringe husks and sweep up the plastic debris from the hammering step. Put your tools and PPE away.