HOW TO MAKE AN INEXPENSIVE TEMPERATURE CONTROLLED DISSOLVED OXYGEN ELECTRODE CHAMBER

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Introduction

When doing respiration experiments with a dissolved oxygen electrode, it is common to run the assay at temperatures that are warmer or cooler than room temperature. Most labs have an expensive circulating temperature controlled water bath and a specially designed respiration chamber. As with most science equipment that you buy, these water baths can be quite expensive ($1000 and up). We present here a way to build your own circulating water bath and temperature controlled respiration chamber for around $20.

Materials:

- Eco 185 submersible pump (used)
- Petercrest aquarium heater (used)
- OPN stirplate
- small stir bar (1cm)
- styrofoam container
- Tygon tubing (8.5mm OD)
- thermometer
- 5 minute epoxy
- 3D printed parts (https://pages.stolaf.edu/opn-lab)
- Scotch extremely strong Velcro

Methods:

Step 1. Using a 3D printer, print the parts for the chamber (Fig.1)

![Figure 1. The 3D printed parts.](image-url)
Step 2. Glue the 3D printed top onto the 3D printed chamber with 5 minute epoxy (Fig.2). Then place a piece of Scotch Velcro on the bottom of the chamber.

Figure 2. The completed chamber.

Step 3. Place the submersible pump into the Styrofoam box. Connect a 16” piece of tubing to the pump outlet and to the bottom port of the chamber. You will need to epoxy the tube on to the chamber port to prevent leakage. Next place another 16” piece of tubing onto the port on the top of the chamber. You will also need to epoxy the tube to prevent leaks. Now place the tube end into the Styrofoam box (Fig.3).

Figure 3. The water pump with the tubing attached.
**Step 4.** Place the chamber onto the OPN Lab stir plate and insert the fish tank heater into the Styrofoam container (Fig. 4).

![Step 4. The chamber attached to the pump and mounted on the stir plate.](image)

**Step 5.** Fill the container with water, turn the fish tank heater on and start the pump. You can fill the respiration chamber with water and place a thermometer in the chamber till the desired temp is reached. You can also cover the top of the Styrofoam box to speed up heating. Filling the box with warm water will also help speed up the heating process (Fig. 5).

![Step 5. The complete respiration set-up with the temperature controlled chamber.](image)