



Tech Note

RPC-100 Respiration/Photosynthesis Chamber

Overview

The RPC-100 is a reaction chamber designed for studying cellular respiration or photosynthesis. In these types of experiments, the chamber is filled with a mixture of cells or cell fractions, buffers, and reagents that react to either consume or produce oxygen. The amounts and rates of oxygen, that are consumed or produced, are measured using a dissolved oxygen electrode placed in the chamber. When mitochondria are studied, the changes in the concentration of oxygen in the chamber provide information about the movement of electrons through the chain of molecules that are responsible for the synthesis of ATP. In the typical experiments used to study mitochondria, oxygen is usually consumed. When chloroplasts are studied, the changes in oxygen concentration provide information about the light-driven movement of electrons through the chain of molecules that are responsible for creating the energy used in the synthesis of sugars. Since the experiments with chloroplasts can be performed on either their intact or their isolated photosystems, oxygen can either be produced or consumed.

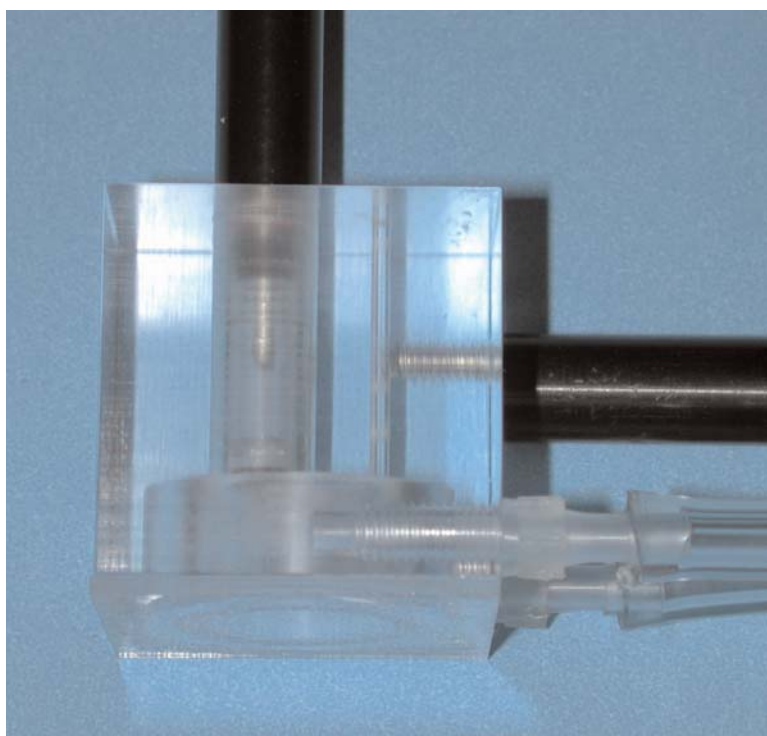


Figure 1: RPC-100 chamber with an ISE-730 electrode in the electrode port (from the top), a support rod in place (on the right), and tubing and connectors (on the lower right) that attach to the water jacket.

How It Works

The cells or cell fractions, buffers, and reagents used in these experiments can be added or removed from the 1.6 milliliter reaction chamber of the RPC-100 through a large electrode port on the top of the chamber. The electrode port is designed to hold the iWorx ISE-730 oxygen electrode at the proper level in the reaction chamber during the experiment (Figure 1 on page 1). When the electrode is removed from the chamber, the electrode port can also be used for cleaning and rinsing the reaction chamber between experiments.

The RPC-100 has a reagent port that connects to the reaction chamber from the top of the chamber. This port is smaller in diameter to restrict the flow of oxygen from the environment into the chamber. In some experiments, reagents need to be added to the reaction mixture; this can be done through the reagent port using a micropipetter with a long, thin tip.

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During experiments, the reaction mixture needs to be mixed to promote the exchange of oxygen across the membrane of the electrode. This is accomplished by placing a small magnetic stir bar in the bottom of the reaction chamber. This stir bar is controlled by a stir motor placed under the chamber.

Since some experiments need to be conducted at temperatures other than room temperature. The temperature of the reaction mixture can be maintained by circulating heated or cooled water through the jacket that surrounds the reaction chamber.

Equipment Setup

1. Attach the RPC-100 chamber to a ring stand or similar support device (Figure 2).
2. Place a stir motor under the chamber.
3. If the temperature of the reaction is going to be maintained at a temperature other than room temperature, connect the tubing between the water jacket and the optional circulating pump.
4. Rinse the reaction chamber several times with deionized water before calibrating the oxygen electrode.
5. Fill the reaction chamber with room temperature deionized water in preparation for the calibration of the oxygen electrode.
6. Place a small, clean Teflon stir bar in the bottom of the reaction chamber and align the stir motor to place the stir bar in the center of the reaction chamber.

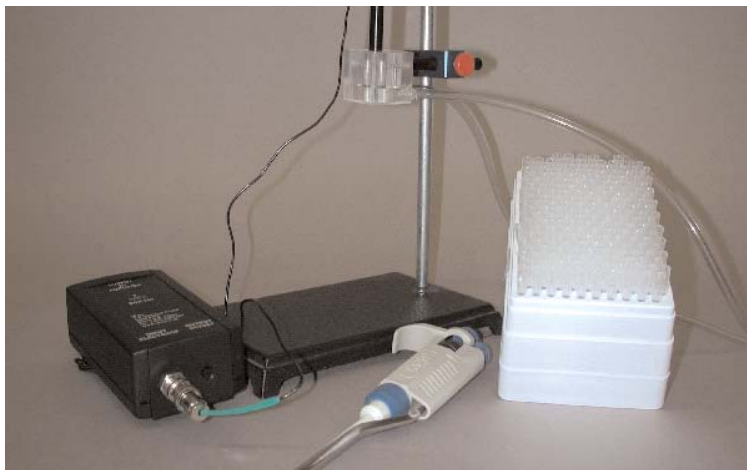


Figure 2: Setup for recording changes in the oxygen concentration of a solution. This setup is also called an oxygen polarograph.

7. Rinse the membrane and membrane holder of the ISE-730 oxygen electrode several times with deionized water before putting it in the electrode port.
8. Carefully place the ISE-730 in the electrode port of the chamber.

Experiments

Experiments using the RPC-100 can be downloaded by clicking on the following links:

[Print-disabled Carbon Dioxide Fixation in Intact Cells Experiment \(PDF file\)](#).

User Area (password protected)

[High resolution press optimized or low resolution screen optimized Carbon Dioxide Fixation in Intact Cells Experiment \(PDF file\)](#)

Specifications

Construction:	Clear acrylic plastic
Volume of Reaction Chamber:	1.6 milliliters
Designed for use with:	iWorx ISE-730 oxygen electrode DO2-100 current to voltage adapter 2mm x 7mm Teflon coated stir bar Gel-loading micropipette tips

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