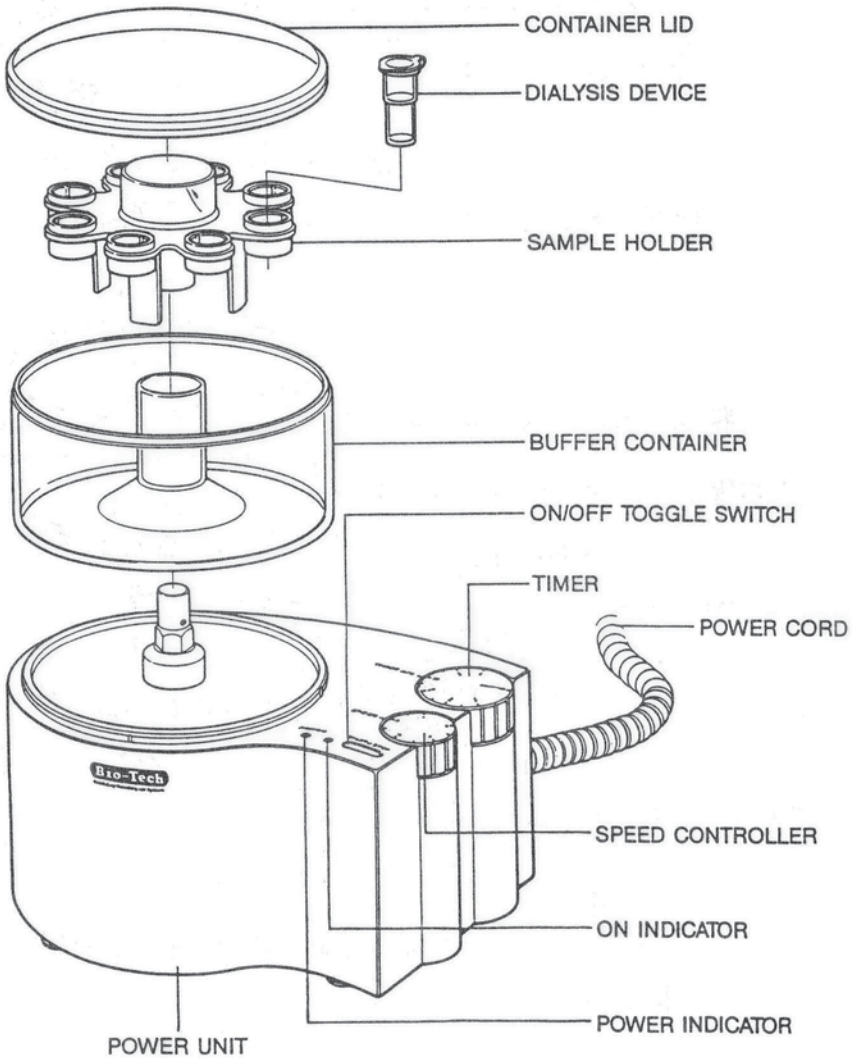
Oscillatory Microdialysis System OMS 102



COSMO BIO CO., LTD.
Inspiration for Life Science
TOYO EKIMAE BLDG. 2-20, TOYO 2-CHOME, KOTO-KU, TOKYO 135-0016 JAPAN
TEL: (81)3-5632-9617 / FAX: (81)3-5632-9618 / e-mail: export@cosmobio.co.jp / URL:www.cosmobio.com

Bio-Tech

Oscillatory Microdialysis System (OMS 102)

Operating Instructions

For Small-Volume Preparation

For *In Vitro* Research Use Only.
Not For Human Diagnostic or Therapeutic Use.

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Section I. General Information

I.1 Introduction

Dialysis is one of well known methods to change the solute composition of a macromolecule solution, such as protein, DNA (deoxyribonucleic acid) solution, into a desired composition using a semipermeable membrane. Currently dialysis membranes made from different kinds of celluloses are available in a variety of molecular weigth cutoffs (MWCO) ranging from 100 to 500,000 daltons. Having dialysis membranes with the wide range of MWCO, one is able to retain the large molecules of interest and remove the unwanted smaller molecules by using appropriate dialysis membranes. Sample loss and dialysis efficiency are the two major concerns for manipulating small sample volumes in dialysis experiments. Traditionally to carry out a dialysis experiment for any size of sample volumes, it is involved to tie knots in a dialysis tubing. It becomes obvious at the hazard of losing a significant amount of precious sample when manipulating a small volume of sample like a fraction of a mililiter. We in **Bio-Tech** design a new Oscillatory Microdialysis System (OMS 102) to maximize sample recovery and dialysis efficiency. Operationally the OMS 102 is very simple and efficient. Using the OMS 102, one does not need tedious assembly, magnetic stirring bar, and magnetic stirer. Agitation of the liquid is achieved by a motion of periodic oscillation of sample holder driven by a motor in the power unit (see the attached schematic diagram of OMS 102 on the previous page). The frequency of oscillation is adjustable to meet physical characteristics of various macromolecules. The oscillatory motion of sample holder results in an increase in the rate of dialysis and leads to an achievement of mixing the sample solution inside the dialysis devices.

The OMS 102 makes microdialysis experiments effortless. As the reservoir container and sample holder are clean, one is able to carry out a dialysis experiment simply by (1) pouring a desired buffer solution into reservoir container; (2) selecting appropriate size of dialysis devices; (3) loading samples to the dialysis devices; and then (4) pressing the Start/Stop switch to initiate the OMS 102. When a preset time is reached, the OMS 102 will stop automatically with a 20-second beep sound to remind user the completion of the experiment. Dialysis can be complete within a very short period of time.

1.2 Specifications

The Oscillatory Microdialysis System (OMS 102) is composed of : a power unit with a power cord, a buffer container, a buffer container lid, and a sample holder. The sample holder can hold up to eight (8) dialysis devices (see the attached schematic diagram of OMS 102 on previous page). The gross weight of entire system without aqueous medium is 3.3 lbs, and the physical dimension is 19 x 14 x 17 cm (L x W x H). The main body of the OMS 102 is the power unit consisting of an oscillatory motor, a timer, and a speed controller. A desired time interval can be adjusted with the timer. A frequency for oscillatory motion of the motor is modulated by the speed controller. Oscillatory speed of the motor can be adjusted as desired. The reservoir buffer container and its lid combine to fully enclose the system during dialysis. The container and lid are made of acrylic copolymer which is characterized by good scratch resistance. Physical properties of acrylic copolymer are not affected by gamma irradiation. The sample holder is made of acrylonitrile butadiene styrene. The dialysis devices are supplied with cellulose membranes attached at the bottom of plastic tube housing, that is made of polycarbonate (PC). Sample volumes from 20 ul to 1,500 ul can be used. Hold-up volume on the cellulose membrane is no more than 10 ul. Two kinds of cellulose membranes, cellulose ester and natural cellulose, have been used to manufacture the dialysis devices. The properties of cellulose ester are chemically and physically different from those of natural cellulose. The former is temperature-sensitive and can tolerate a narrow range of temperature. Thus, to preserve its functional integrity it has to maintain this type of membranes in aqueous medium at a temperature not higher than 37℃. To prolong its lifespan, the dialysis devices with membranes made of cellulose ester are recommended to be stored at 4℃. The structural integrity of dialysis membranes made from natural cellulose is remained sound at a temperature higher than 37℃. In general, the dialysis devices with membranes made of natural cellulose are supplied dry. Dry membranes are coated with glycerol to preserve its moisture. Glycerol and trace impurities on the dry membrane can be removed by rinsing with distilled deionized water prior to a dialysis experiment. Physical dimension of the dialysis devices is 33 x 8 mm (H x I. D.). With a variety of molecular weight cutoff membranes, the dialysis devices can efficiently process a wide range of macromolecules in different molecular weights, such as peptides, proteins, DNA, and polynucleotides, etc.

Section II. Description of Major Parts

II. 1 Power Unit

The power unit consists of an oscillatory motor, a timer, and a speed controller. The entire unit is a leak-free apparatus. A desired time interval ranging from 5 to 60 minutes for a dialysis experiment can be set by adjusting the timer. For a continuous mode timer can be set at infinite mark. The frequency of oscillatory motion is adjusted by the speed controller. The larger the number is set, the faster the oscillatory motion will be. Oscillatory speed of sample holder can be adjusted as desired. The number of revolutions per minute (RPM) for the settings on speed controller is given in Table I. Using the OMS 102, the manufacturer has conducted a few dialysis experiments to determine the structural integrity of high-molecular-weight DNA. The preliminary results suggest that use of a lower speed may reduce the possibility of degrading the high-molecular-weight DNA during the course of a dialysis experiment. It is very difficult to specify which oscillatory speed should be used for a specific high-molecular-weight DNA. In general, for a new high-molecular-weight molecule the lowest speed (refer to

Table I) should be used for the first time. Thus, to preserve the structural integrity and to avoid the degradation of a high-molecular-weight molecule resulting from mechanical forces, such as shearing force, the manufacturer recommends that an appropriate speed for a specific sample should be determined experimentally.

Table I. RPM Setting on Speed Controller

Set at	RPM ± 5%
1	28
2	38
3	50
4	56
5	60

II. 2 Reservoir Container and Lid

The reservoir buffer container and lid combine to fully enclose the system during dialysis. It is not recommended to remove the lid during dialysis.

II. 3 Multi-Sample Holder

Each sample holder can hold eight (8) dialysis devices. Dialysis devices are manufactured with permanently attached leak-free semipermeable membranes. It is recommended to remove glycerol and impurities on dry cellulose membranes by soaking the dialysis devices in distilled water for 60 minutes. For the dialysis devices supplied with wet cellulose membranes it is recommended by the manufacturer to rinse entire devices thoroughly with distilled water prior to a dialysis experiment. With a variety of molecular weight cutoff membranes, thus, these devices can efficiently process a wide range of macromolecule samples, such as peptide, protein, DNA, and polynucleotide with a hundred base pairs, etc.

Section III. Dialysis Procedure

1. Remove the lid of reservoir buffer container.

2. Pour a desired dialysis buffer solution into the reservoir container upto the limit line. Do not overfill the container.

3. Select appropriate dialysis devices. Transfer samples into dialysis devices and close the cap.

NOTE : (1) To enhance dialysis rate, it is recommended to load 250 ul (or less) of sample to each dialysis device. (2) To minimize a change in sample volume, the cap on dialysis device should be closed.

4. Load dialysis devices into sample holder and then firmly attach the sample holder to the drive shaft of power unit and replace the container lid.

NOTE : To prolong the lifetime of power unit, it is advisable to balance the sample holder when loading the dialysis devices.

5. Adjust timer and oscillatory frequency. Press the Start/Stop switch to activate the OMS 102.

NOTE : (1) Higher oscillatory frequency will increase dialysis efficiency, however, some macromolecules may become degraded at higher speed due to shearing and/or shaking force. (2) Dialysis process can be stopped at any time prior to its completion by pressing the Start/Stop switch again.

6. To recover the well-dialyzed samples, remove dialysis devices from the sample holder. Tilt the dialysis devices and carefully transfer samples to the clean vials with an Eppendorf pipet.

Section IV. Maintenance of Equipment

1. Wash the reservoir container and multi-sample holder with a laboratory detergent and then rinse thoroughly with distilled water after every use.

2. It is recommended to rinse the container and sample holder with a 1 N HCl solution for sterilization of components.

WARNING!!! Extreme caution should be taken for acid cleaning. It is recommended to wear rubber gloves, lab coat, and safety glasses.

Notice

If you are a first-time user, please read this note before you work with these microdialysis devices.

A. Microdialysis devices (MWCO = 6,000 − 8,000 daltons) are supplied with dry natural cellulose membranes which are mounted at the bottom of the plastic tube housing. The tube housing is made of polycarbonate (PC).

B. Dry membrane contains glycerol and trace impurities which can be removed either by adding water to the tubes and then load them to the OMS 102, run the OMS 102 for 15 minutes, or by soaking in water for 60 minutes or longer. The whole device can be boiled in distilled water for two minutes to remove impurities. After boiling, cool the devices gradually in water. Sudden change in temperature may damage the membrane.

C. It is recommended by the manufacturer that unused dialysis devices must be kept in an airtight moisture-proof container in a cool place, such as a refrigerator.

D. These microdialysis devices are designed and manufactured for ***in vitro*** research use only . Not for human diagnostic or therapeutic use.

Bio-Tech *International, Inc.*

Notice

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I certify that : _____

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Notice

Upon arrival, store the pre-treated dialysis devices in a refrigerator.

If you are a first-time user, please read this note before you work with these microdialysis devices.

A. Microdialysis devices are supplied with wet cellulose membranes which are mounted at the bottom of the plastic tube housing. The tube housing is made of polycarbonate (PC).

B. Membranes are provided in 0.05% sodium azide. Prior using these dialysis devices, rinse with distilled water or an appropriate buffer solution. They are then ready to use. For sterilization, the whole device can be boiled in distilled water for two minutes. After boiling, cool the devices gradually in water. Sudden change in temperature may damage the membrane.

C. It's recommended by the manufacturer that unused dialysis devices must be kept in an airtight moisture-proof container in a cool place, such as a refrigerator.

D. These microdialysis devices are designed and manufactured for in vitro research use only. Not for human diagnostic of therapeutic use.