NaRiKa

Cat. No F35-1334-W0

Safety Closed Electrolysis Equipment S-PG

Instruction Manual

Safety Instruction

Instruction manual contains important information about use of this product.
Be sure to read it carefully and thoroughly before using this product.

⚠Warning

- ⊘ This is not a toy. Not intended for children 12 years and younger.
- ⊘ Do not disassemble, repair and/or remodel this product.
- ⊘ Stop using this product once occurrence of an abnormal or malfunction state is found. Please contact global@rika.com regarding any problem.
- ! How to operate this product must be explained to students by teacher (instructor) prior to the experiment.

⚠Caution

- ⊘ Use this product only under the direction of teacher (instructor).
- ⊘ Pour electrolytic solution not more than 100 ml into the tank.
- ⊘ Prohibition of use for purposes other than originally intended. The purpose of the equipment is to use for electrolysis experiments in science education.
- ! Check the condition of the equipment before and after long-term storage and stop using it once occurrence of an abnormal state is found.
- ! Handle this product with care because sensitive parts such as platinized titanium electrodes are used.
- ! Be sure to wear safety goggles during experiment.
- ! Be sure to remove air vent plug before starting electrolysis reaction experiments. Otherwise electrolyte sprayed out of the tank by internal pressure may hurt you.
- ! Be sure to drain electrolyte from the tank after experiment. And let the equipment dry thoroughly, after that store in dry condition.
- ! Be sure to slowly tilt the body of equipment because rubber plug may come off when you transfer the electrolyte into electrolysis tubes.
- ! Stop the reaction of electrolysis before gases reach lower limit of scale on one of the electrolysis tubes.

Introduction

Intended purpose of this product

This product is intended for experiments of electrolysis as shown below with platinized titanium electrodes for both of teacher demonstration and student experiments.

1. Electrolysis of water (sodium hydroxide solution) (NaOH) (aq)
2. Electrolysis of hydrochloric acid solution (HCl) (aq)
3. Electrolysis of sodium chloride solution (NaCl) (aq)

Feature of this product

1. Equipped with built in platinized titanium electrodes

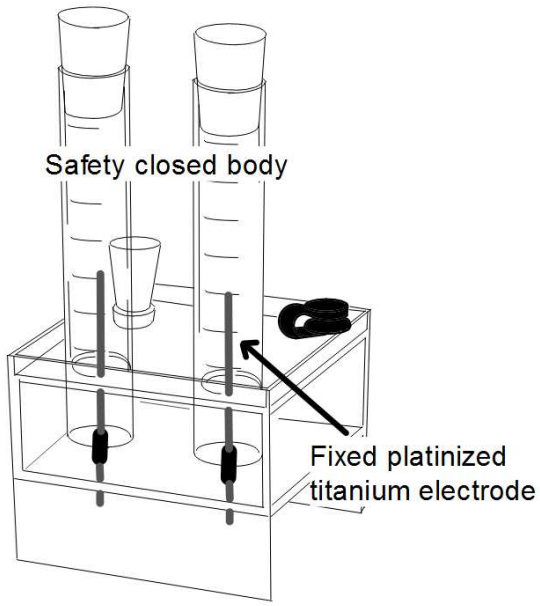
In the case of conventional electrolysis equipment, you had had to choose an appropriate electrode for electrolytes (carbon or stainless steel), however by using this equipment, you do not need to do that, you do not need to change the electrode because it has platinized titanium electrode with high acid and corrosion resistance that reacts with various types of solutions.

2. Safety design of closed electrolysis for student experiments

This product is a safety closed electrolysis equipment of which you can easily and safely refill or replace an electrolyte with other type of solution (e.g. sodium hydroxide solution or hydrochloric acid solution). Therefore, it is a suitable equipment for students' experiments because it easily inspires students. However, you must make students wear safety goggles and gloves during their experiment.

3. Platinized titanium electrodes (Pt-Ti)

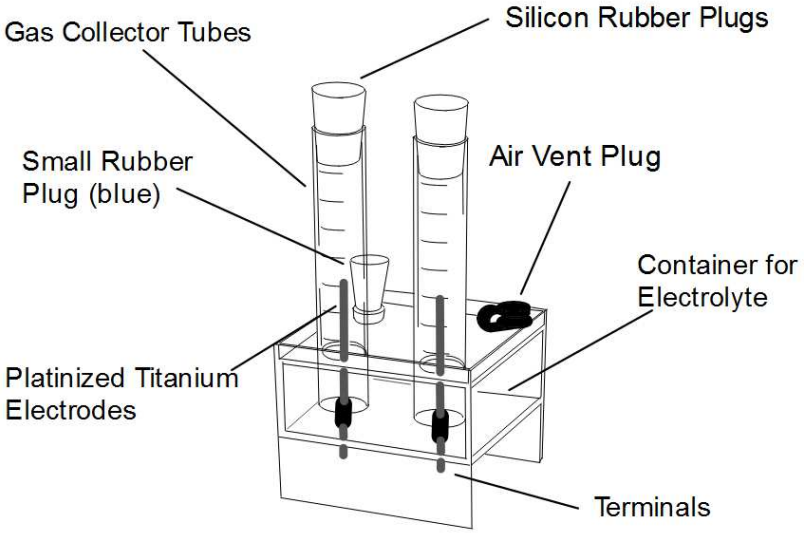
This electrode is a corrosion-proof and heat resistance titanium metal which surface is plated by platinum. Therefore, you do not need to change this electrode to other type depending on the experiment. Additionally, you may get theoretical results of electrolysis because of its catalytic effect that makes electrolysis reaction more easily and effectively.



Contents and Specification of this product

1. Platinized titanium electrode x 2 (built-in)
2. Soft silicone rubber plug (white) x 2
3. Small silicone rubber plug (blue) x 1
4. Air vent plug x 1

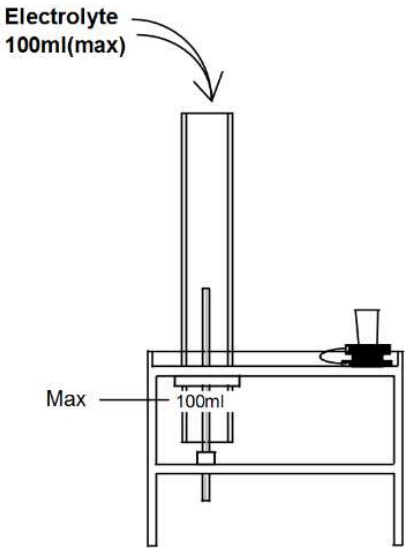
Size: 80(W) x 80(D) x 140(H) mm
Material: Polyvinyl chloride (PVC)
Maximum allowable capacity of electrolysis solution (electrolyte): 100ml

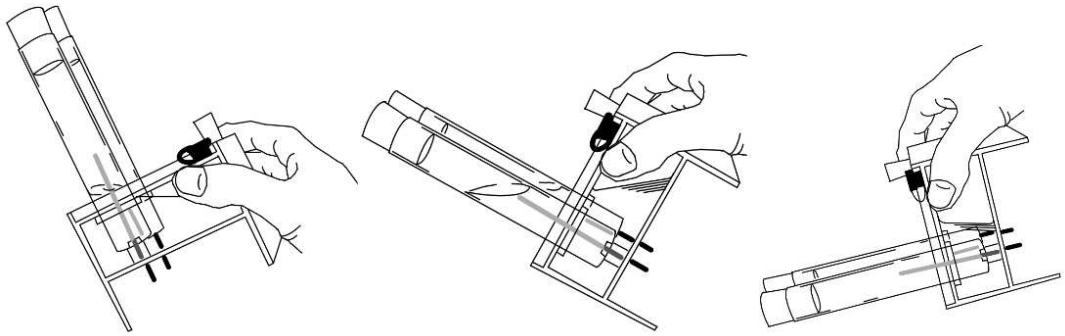


Experiment Procedure

(1.) How to fill the gas collecting tubes with electrolyte.

1. Remove silicone rubber plugs from top of gas collecting tubes.
2. Pour 100 ml of electrolyte into the tank from top of its gas collecting tube. **Caution: Do not pour more than 100 ml of electrolyte into the tank.**
3. Securely fit the soft silicone rubber plugs into top of the gas collecting tubes, and tightly close plug both of air vent and small rubber plug.
4. Tilt the body of electrolysis equipment to transfer the air in the gas collecting tubes to the tank, until the tubes are filled with electrolyte fully (following figures A to C below).
5. Raise the body slowly and place it on a flat table. This time, check whether no air remains in the gas collecting tubes. If any air in the tubes remain, do the step 4 again.





(2.) Procedure of electrolysis of water experiment.

[Preparation]

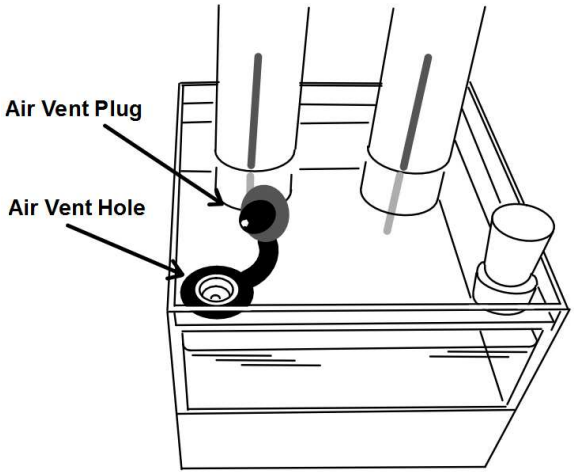
a. 5% of Sodium hydroxide solution (NaOH); 100 ml

b. Power supply; 0 ~ 15 DCV, <5A (B10-2632-W0 Genecon DUE can be also used)

c. Incense sticks; some

d. Matches; some

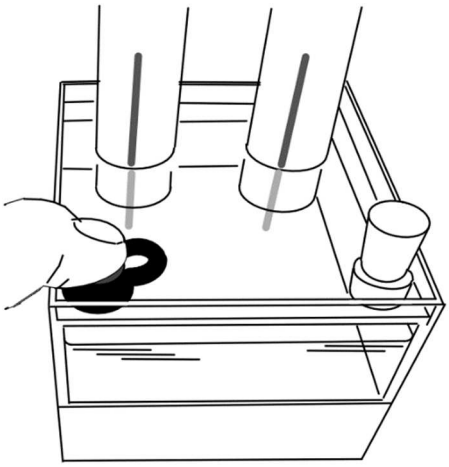
[Experiment procedure]



1. Fill the gas collecting tubes with electrolyte following previously mentioned procedure (1.).
2. Connect leads of power supply with the terminals which are beneath the bottom of the tank.
3. Remove the air vent plug to open the air vent hole (a small hole that relieves excessive pressure from the inside of the tank) before starting an experiment of electrolysis.
4. Powered by direct current 6V from the power supply, gases are produced at each of the electrodes in gas collecting tubes. Oxygen gas is produced at positive electrode and Hydrogen gas is produced at negative electrode.
5. After 5 minutes, switch off the power supply to complete the electrolysis. And compare volume of each gas. Confirm the ratio of generated gases is about 2:1.

Caution: The electrolysis reaction should only be within the range of the scale on the gas collecting tubes to avoid overreaction which may cause a flammable and explosive mixtures of gases inside.

[Identify what kind of gases were produced]



1. Put the air vent plug on the air vent hole to close the hole.
2. Cover a small hole in the air vent plug by your finger for identifying gases part of the experiment.

1) Procedure to identify the gas generated at the negative electrode.

Identification of hydrogen is possible by hearing an explosion sound of reaction with oxygen. Put a match flame on the top of gas collecting tube soon after the silicone rubber plug is removed. If you can hear explosion sound, it is hydrogen, otherwise it isn't hydrogen.

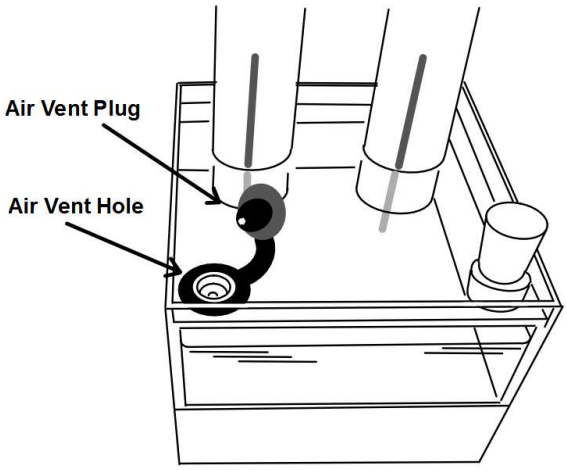
2) Procedure to identify the gas generated at the positive electrode.

Identification of oxygen is possible by confirming the change of intensity of smoldering when a burning incense stick is brought close to oxygen gas. Insert a burning incense stick into the top of gas collecting tube soon after the silicone rubber plug is removed. If you can observe its burning condition is intensified, gas in the tube is oxygen. If you cannot observe any changes, it is otherwise.

3. Experiments method of electrolysis of a salt solution.

[Preparation]

a. 20% of Sodium Chloride solution (NaCl); 100 ml
b. Power supply; 0 ~ 15 DCV, <5A
c. Matches; some
d. Filter paper; some
e. Methylene blue: some



[Experimental procedure]

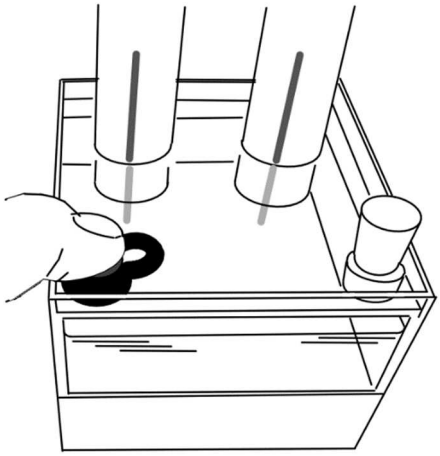
1. Fill the gas collecting tubes with electrolyte following previously mentioned procedure (1).
2. Connect leads of power supply with the terminals which are beneath the bottom of the container.
3. Remove the air vent plug to open the air vent hole (a small hole that relieves excessive pressure from the inside of the tank) before starting an experiment of electrolysis.
4. Powered by direct current 6V from the power supply, gases are produced at each electrode in gas collector tubes. Chlorine gas is produced at positive electrode and Hydrogen is produced at negative electrode. **Note: As chlorine gas is readily-soluble in water, its gas may not be collected in tube.**
5. After 5 minutes, switch off the power supply to complete the electrolysis.

Caution: The electrolysis reaction should only be within the range of the scale on the gas

collecting tubes to avoid leaking a poisonous chlorine gas in the container by overreaction.

[Identify what kind of gases were produced]

1. Put the air vent plug on the air vent hole to close the hole.
2. Cover a small hole in the air vent plug by your finger for identifying gases part of the experiment.



1) Procedure to identify the gas which was generated at the negative electrode.

Identification of hydrogen is possible by hearing an explosion sound of reaction with oxygen. Put a match flame on the top of gas collecting tube soon after the silicone rubber plug is removed. If you can hear explosion sound, it is hydrogen, otherwise it isn't hydrogen.

2) Procedure to identify the gas which was generated at the positive electrode.

Identification of chlorine is generally done by confirming the ability of bleaching or the smell of chlorine. To confirm the bleaching ability, drop few drops of chlorine solution which is in positive side of gas collecting tube onto colored paper (use syringe or dropper). If you observe its color to changed, chlorine was produced at the positive electrode.

Note: Dye filter paper with methylene blue to make colored paper beforehand.

Cleanup and maintenance after experiments

*To keep the equipment in a good condition, drain the electrolyte such as sodium hydroxide solution and sodium chloride solution by using the small hole to a waste tank after the experiments and wash inside of the tank, then let dry naturally.

*This safety closed electrolysis equipment is not designed for long term storage of electrolytes in the tank. Therefore, if you leave it with electrolytes for long time, platinized condition of electrodes will be damaged and its performance will deteriorate.

*Do not use any organic solution to wash or clean it because it will damage the product. If the equipment needs to be washed using cleaner, use a neutral detergent.

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