

HG

**CHEMICAL INDUSTRY STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

HG/T 6093-2022

Bipolar membranes

双极膜

(English Translation)

Issued on: October 20, 2022

Implemented on: April 1, 2023

**Issued by: Ministry of Industry and Information Technology of the
People's Republic of China**

Table of Contents

Foreword	3
1 Scope	4
2 Normative References	4
3 Terms and Definitions	4
4 Requirements	6
5 Test Methods	7
6 Inspection Rules	20
7 Marking, Packaging, Transportation and Storage	21
Appendix A (Informative) Schematic Diagram of Testing Device	24

1 Scope

This Document specifies the requirements, test methods, inspection rules, marking, packaging, transportation and storage of bipolar membranes.

This Document applies to the research and development, production, inspection and use of bipolar membrane products.

2 Normative References

The provisions in following documents become the essential provisions of this Document through reference in this Document. For the dated documents, only the versions with the dates indicated are applicable to this Document; for the undated documents, only the latest version (including all the amendments) is applicable to this Document.

GB/T 191 Packaging - Pictorial marking for handling of goods

GB/T 601-2016 Chemical Reagent - Preparations of Standard Volumetric Solutions

GB/T 4456 Polyethylene blown film for packaging applications

GB/T 6543 Single and double corrugated boxes for transport packages

GB/T 6682-2008 Water for analytical laboratory use - Specification and test methods

GB/T 9174 General specification for transport packages of general cargo

GB/T 9969 General Principles for Preparation of Instructions for Use of Industrial Products

3 Terms and Definitions

For the purposes of this Document, the terms and definitions given in GB/T 20103-2006 and HY/T 166.1-2013 and the following apply.

3.1 Bipolar membrane

A membrane with a multi-layer functional structure composed of anion and cation exchange layers and a transition layer with water dissociation catalysis in the middle. [Source: GB/T 20103-2006, 3.1.7, modified]

3.4 Dimensional changes

The extent to which the geometric dimensions of a membrane change when it is transferred from one solution to another.

3.5 Area resistance

The resistance value of a film specimen of a certain area.

3.6 Trans-membrane voltage

in a given solution, the trans-membrane flow of a certain amount of charged ions results in a potential difference on both sides of the membrane.

3.7 Tolerance of chemical reagent

After soaking in a specific concentration of chemical reagent for a certain period of time. The extent of membrane damage.

4.1 Appearance

The appearance of the bipolar membrane shall be smooth and clean, without mechanical damage or pinholes, no wrinkles, no oil, or no debris.

4.4 Bursting strength

The bursting strength of the bipolar membrane shall be no less than 0.25 MPa.

4.5 Dimensional changes

The change rate of the length, width and thickness of the bipolar membrane when transferred from pure water to 2 mol/L hydrochloric acid solution shall be no greater than 8%.

4.6 Area resistance

The area resistance of the bipolar membrane shall be no greater than 10 ohm·cm².

4.7 Trans-membrane voltage

The trans-membrane voltage of the bipolar membrane at a current density of 100 mA/cm² shall be no greater than 1.5V.

4.9 Generation rate of acid or base

At a current density of 40 mA/cm², the generation rate of acid or base of the bipolar membrane shall be no less than 0.15 mol/ (m² · min).

5.1 Appearance

The visual inspection and inspection results shall meet the requirements of 4.1.

5.3.1 Test conditions

The test shall be carried out in a constant temperature room at 25°C ± 1°C.

5.3.2 Test principle

The dissociable ions attracted to the fixed groups in the membrane can equivalently exchange with counter ions in the solution. The exchange capacity of the membrane is determined by titrating the dissociable ions exchanged with the counter ions in the solution.

5.3.4 Chemical reagents

Sodium hydroxide, hydrochloric acid, silver nitrate, sodium sulfate, potassium hydrogen phthalate, sodium chloride, phenol hydroxide, potassium chromate, pure water.

Among them, sodium chloride and potassium hydrogen phthalate are the primary reagents, and the rest are of analytically pure. The used standard solution is prepared in accordance with the provisions of GB/T 601-2016; and the pure water shall comply with the secondary water standard specified in GB/T 6682-2008.

5.3.5.3 Determination of moisture content

The determination of moisture content shall be carried out according to the test method specified in 6.3 of HY/T 166.1-2013.

5.3.5.4 Determination of ion exchange capacity of cation exchange layer

The procedures for measuring the ion exchange capacity of the cation exchange layer are as follows.

5.3.5.5 Determination of ion exchange capacity of anion exchange layer

The procedures for measuring the ion exchange capacity of the anion exchange layer are as follows.

5.4 Bursting strength

The determination of the bursting strength of the bipolar membrane shall be carried out in accordance with the test method specified in 6.6 of HY/T 166.1-2013.

5.5.1 Test conditions

The test shall be carried out in a constant temperature room at $25^{\circ}\text{C}\pm 1^{\circ}\text{C}$.

5.8.1 Test conditions

The test is carried out in a constant temperature room at $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$.

5.8.4.1 Acid tolerance of chemical reagent

The test procedures for acid tolerance of chemical reagents are as follows.

5.9.1 Test conditions

The test shall be carried out in the constant temperature room at $25^{\circ}\text{C}\pm 1^{\circ}\text{C}$.

5.9.2 Test principle

Place the bipolar membrane in an electrodialysis membrane stack containing electrode plates; introduce the sodium sulfate solution. Apply a DC electric field on both sides of the bipolar membrane; measure the amount of acid and base produced in the acid-base chamber under fixed current density conditions, and calculate the generation rate of acid or base.

5.9.3 Apparatus

The apparatus required for the test is as follows.