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Determination of the pore size of membranes - Gas permeation method

分离膜孔径测试方法 气体渗透法

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Foreword

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Ma Bing, Jie Xingming, Gao Xu, Zhang Hongbin, Chen Jie, Xi Xuejie, Ma Lanyun. Separation Membrane Pore Size Test Method Gas Permeation Method

1 Scope

China's national method for determining the average pore size of separation membranes by gas permeation. The pore size is the property that defines what a membrane does - what it retains and what it passes - and measuring it is less direct than it sounds, because a membrane does not have a pore size but a distribution, and the pores are neither cylindrical nor straight. The gas permeation method infers the size from flow: gas is passed through the dry membrane at a series of pressures, and the relationship between flow and pressure distinguishes viscous flow through larger pores from Knudsen diffusion through smaller ones, from which a mean size follows. Its advantage over the bubble point and the liquid displacement methods is that it is non-destructive and needs no wetting liquid, so the membrane can be used afterwards - which matters when the sample is a module rather than a coupon.

This document describes a method for determining the average pore size of separation membranes using the gas permeation method. This document is applicable to the test of the average pore diameter of flat membranes and hollow fiber membranes with a pore diameter of 0.01 μm to 0.2 μm in a dry state. The separation membrane of the formula can be implemented with reference. This document is applicable to the test gas that is nitrogen, and other non-condensable gases, such as He, H2, O2, Ar, etc., can refer to this document for implementation.

2 Normative references

The contents of the following documents constitute the essential provisions of this document through normative references in the text. Among them, dated references For documents, only the version corresponding to the date is applicable to this document; for undated reference documents, the latest version (including all amendments) is applicable to this document.

GB/T 2918-2018 Standard environment for conditioning and testing of plastic specimens

GB/T 8979-2008 Pure Nitrogen, High Purity Nitrogen and Ultra Pure Nitrogen

GB/T 20103-2006 Membrane Separation Technical Terminology

3 Terms and Definitions

The following terms and definitions defined in GB/T 20103-2006 apply to this document.

3.1 flat membrane flatmembrane The appearance is a flat or paper-like film. NOTE. Flat sheet membranes usually have a support layer (e.g., non-woven fabric) for the preparation

of plate-and-frame, pleated, and spiral-wound membrane elements. [Source: GB/T 20103-2006, 2.1.27]

3.2 Hollow fiber membrane holowfibermembrane The appearance is a fibrous, hollow, self-supporting membrane.

Note. For reverse osmosis membranes, the cortex is on the outer surface; for ultrafiltration and microfiltration membranes, the cortex is on the inner surface, outer surface, or inner and outer surfaces. [Source: GB/T 20103-2006, 2.1.28]

3.3 Aperture porediameter Nominal membrane pore diameter. [Source: GB/T 20103-2006, 2.1.31]

3.4 Average pore size meanporesize The average pore size of the membrane surface. [Source: GB/T 20103-2006,5.1.6]