

TEST REPORT

CLIENT: Polyguard Products
PO Box 755
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Attn.: Wallace Arnold

MATERIALS: Two samples of sheet material were delivered and identified by the client as #750, and #751. Each sample consisted of two pieces, each measuring 10 x 10 inches.

TEST: The gas permeance of the samples to oxygen was determined according to ASTM D 1434-82 (Reapproved 1998), "Standard Test Method for Determining Gas Permeability Characteristics of Plastic Film and Sheeting," Procedure V (volumetric). The purity of the oxygen was at least 99.6%. The test temperature was 50°F (10°C). The pressure difference was between 43 and 65 psig. Two specimens of each sample were tested. Several trials were run on each specimen in order to determine whether the permeance had reached a steady state. The tests were conducted on March 12 – April 1, 2002.

RESULTS: The permeance of the samples is shown in the table below, in three different sets of units. Gas volumes are calculated at standard conditions of 0°C and 101.3 kPa (14.7 psi).

Oxygen permeance results				
sample	specimen	Permeance		
		mol/(m ² ·s·Pa)	mL/(m ² ·hr·Pa)	ft ³ /(ft ² ·hr·psi)
750	1	2.7 x 10 ⁻¹³	2.1 x 10 ⁻⁵	4.8 x 10 ⁻⁷
	2	2.6 x 10 ⁻¹³	2.1 x 10 ⁻⁵	4.8 x 10 ⁻⁷
	average	2.6 x 10⁻¹³	2.1 x 10⁻⁵	4.8 x 10⁻⁷
751	1	4.4 x 10 ⁻¹³	3.5 x 10 ⁻⁵	8.0 x 10 ⁻⁷
	2	5.0 x 10 ⁻¹³	4.0 x 10 ⁻⁵	9.1 x 10 ⁻⁷
	average	4.7 x 10⁻¹³	3.8 x 10⁻⁵	8.6 x 10⁻⁷

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DISCUSSION: It should be noted that the ASTM standard states that the SI unit for permeance is $1 \text{ mol}/(\text{m}^2 \cdot \text{s} \cdot \text{Pa})$, and that permeance is the gas transmission rate (GTR) divided by the pressure difference. The equation for GTR in SI units of $1 \text{ mol}/(\text{m}^2 \cdot \text{s})$, as described in the ASTM standard is:

$$\text{GTR} = 10^{-6} \times p_o \cdot V_r / (A \cdot R \cdot T)$$

where:

p_o = ambient pressure, Pa

V_r = volume flow rate, $\mu\text{L}/\text{s}$

A = transmitting area of specimen, mm^2

R = universal gas constant, $8314.3 \text{ (L} \cdot \text{Pa)} / (\text{mol} \cdot \text{K})$

T = ambient temperature, K

The "10⁻⁶" term is incorrectly inserted in the equation to obtain the SI units (if the area is entered in units of mm^2 as specified) and was therefore not used in the calculations for this report.

The equation for calculating permeance is: $P = \text{GTR} / (p - p_o)$
where p is the test gas pressure in Pa.

REPORT BY:



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REPORT REVIEWED BY:



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