

**TEST REPORT**



**CLIENT:** Polyguard Products  
PO Box 755  
Ennis, TX 75120-0755  
Attn.: Nancy Hurley

**MATERIALS:** Two samples of sheet material were delivered and identified by the client as "Polyguard Underseal XT 750", and "Polyguard Underseal XT 751". Each sample consisted of two sheets, each measuring 12 x 12 inches.

**TEST:** The gas permeance of the samples to methane 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 methane was at least 99.99%. The test temperature was 50°F (10°C). The pressure difference was approximately 50 psig. One specimen of each sample was 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 October 3-14, 2003.

**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).

Methane permeance results				
sample	trial	Permeance		
		mol/(m <sup>2</sup> ·s·Pa)	mL/(m <sup>2</sup> ·hr·Pa)	ft <sup>3</sup> /(ft <sup>2</sup> ·hr·psi)
XT 750	1	3.2 x 10 <sup>-13</sup>	2.6 x 10 <sup>-5</sup>	5.9 x 10 <sup>-7</sup>
	2	3.7 x 10 <sup>-13</sup>	3.0 x 10 <sup>-5</sup>	6.7 x 10 <sup>-7</sup>
	3	3.5 x 10 <sup>-13</sup>	2.8 x 10 <sup>-5</sup>	6.4 x 10 <sup>-7</sup>
	<b>average</b>	<b>3.5 x 10<sup>-13</sup></b>	<b>2.8 x 10<sup>-5</sup></b>	<b>6.3 x 10<sup>-7</sup></b>
XT 751	1	4.3 x 10 <sup>-13</sup>	3.5 x 10 <sup>-5</sup>	7.9 x 10 <sup>-7</sup>
	2	3.6 x 10 <sup>-13</sup>	2.9 x 10 <sup>-5</sup>	6.5 x 10 <sup>-7</sup>
	3	4.0 x 10 <sup>-13</sup>	3.2 x 10 <sup>-5</sup>	7.3 x 10 <sup>-7</sup>
	<b>average</b>	<b>4.0 x 10<sup>-13</sup></b>	<b>3.2 x 10<sup>-5</sup></b>	<b>7.2 x 10<sup>-7</sup></b>

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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,  $\text{mm}^2$

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

T = ambient temperature, K

The "10<sup>-6</sup>" term is incorrectly inserted in the equation to obtain the SI units (if the area is entered in units of  $\text{mm}^2$  as specified) and was therefore not used in the calculations for this report.

Permeance is calculated as GTR divided by the test gas pressure.

**REPORT BY:**

  
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**REPORT REVIEWED BY:**

  
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