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TEST REPORT

CLIENT: Polyguard Products, Inc.
PO Box 755
Ennis, TX 75120-0755
Attention: Chris Rogalski

OBJECTIVE: Determination of methane permeance characteristics of a sheet barrier material.

SAMPLE: One sample of a sheet barrier material was submitted by the client on April 28, 2014 and was identified as "Term Barrier". The sample consisted of a 12 x 12 inch sheet that had a pink film on one side and a green nonwoven surface on the other.

TESTING: The permeance of the sample to methane gas was measured according to Procedure V of ASTM D1434-82(2009)[e1], *Standard Test Method for Determining Gas Permeability Characteristics of Plastic Film and Sheeting.* 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. The pink side of the specimen was oriented towards the high pressure methane. One specimen was tested. Testing was completed on June 30, 2014.

RESULTS: The average thickness of the specimen was 0.0898 inch, measured at five points. The standard deviation of the measurements was 0.0014 inch.

The permeance of the sample is shown in the table below in three different sets of units. Gas volumes are calculated at standard conditions of 0°C (32°F) and 101.3 kPa (14.7 psia).

Methane permeance results			
	Permeance		
trial	$mol/(m^2 \cdot s \cdot Pa)$	$mL/(m^2 \cdot hr \cdot Pa)$	$ft^3/(ft^2 \cdot hr \cdot psi)$
1	1.56E-13	1.26E-05	2.85E-07
2	1.52E-13	1.23E-05	2.77E-07
3	1.30E-13	1.05E-05	2.37E-07
average	1.46E-13	1.18E-05	2.66E-07

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

$$GTR = 10^{-6}\, p_o V_r / (ART)$$

where:
p_o = ambient pressure, Pa
V_r = volume flow rate, $\mu L/s$
A = transmitting area of specimen, $\mathrm{mm^2}$
R = universal gas constant, 8314.3 $(\mathrm{L \cdot Pa})/(\mathrm{mol \cdot K})$
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 $\mathrm{mm^2}$ 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 WRITTEN BY:

**DATA AND
REPORT REVIEWED BY:**

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John Hindman   Douglas Bert
Engineer II   Department Manager