

October 16, 2024

TEST REPORT


PN 176339
Credit Card

PHARMACEUTICAL TESTING SERVICES

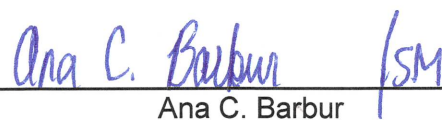
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An A2LA ISO 17025 Accredited Testing Laboratory-
Certificate Numbers 255-01, 255-02, 255-03 and 255-04
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ISO 9001:2015
Registered

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PolyConversions, Inc.

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SUBJECT: Chemical Permeation Testing per ASTM F739-20 on samples submitted by the above company.

RECEIVED: One (1) Gown type identified by customer as Personal Protection VR Gown Blue with Elastic Cuffs, Size Regular, Gauge 4 mil.

Testing Location: 2887 Gilchrist Road, Akron, OH 44305

Decision Rules

Customer Selected Decision Rule: Decision Rule 1

TEST CHEMICALS:

Table 1.1 List of the Tested chemicals and their Sources, Lots and CAS#'s.

TEST CHEMICAL	CHEMICAL SOURCE
Acetone	Spectrum; Lot#21L0284, CAS# 67-64-1
Ammonium Fluoride 40%	BTC; Lot# 50090603, CAS# 12125-01-8
Ammonium Hydroxide 28-30%	Sigma; Lot# MKCW108, CAS# 1336-21-6
Acetic Acid 99%	Sigma; Lot# MKCS4274, CAS# 64-19-7
N-Butyl Acetate	Spectrum; Lot# 2KJ0273, CAS# 123-86-4
Citric Acid 10-15%	Sigma; Lot# MKCR2007, CAS# 77-92-9
Ethyl Acetate	Sigma; Lot# SHBI1336, CAS# 141-78-6
Ethanolamine	Sigma; Lot# MKTC2735, CAS# 141-43-5
Ethylene Glycol	Sigma; Lot# SHB06288, CAS# 17-21-1
Hexamethyldisilazane (HMDS)	Sigma; Lot# STBK9369, CAS# 999-97-3
Hydrochloric Acid 37%	Sigma; Lot# MKCV3835, CAS# 7647-01-0
Hydrochloric Acid 32%	Sigma; Lot# MKCV3835, CAS# 7647-01-0
Hydrofluoric Acid 48%	VWR; Lot# 202422815, CAS# 766-39-3
Hydrofluoric Acid 1%	VWR; Lot# 202422815, CAS# 766-39-3
Hydrogen Peroxide 30%	Sigma; Lot# K55616600, CAS# 7722-84-1
Isopropyl Alcohol 99%	Spectrum; Lot# 2LG0110, CAS# 67-63-0
Nitric Acid 70%	Sigma; Lot# MKCR9877, CAS# 7697-37-2
Phosphoric Acid 85%	Sigma; Lot# MKCS6748, CAS# 7664-38-2
Potassium Hydroxide 10-50%	Sigma; Lot# MKCQ3507, CAS# 1310-58-7
Propylene glycol monomethyl ester acetate	Sigma; Lot# MKCS7087, CAS# 108-65-6
Sodium Hydroxide 50%	Spectrum; Lot# 1LH0306, CAS# 1310-73-2
Sulfuric Acid 96%	Sigma; Lot# MKCV2949, CAS# 7664-93-9
Sodium Hypochlorite 10-13%	Sigma; Lot# MKCV3014, CAS# 7681-02-9
Tetramethylammonium hydroxide	Sigma; Lot# MKCW3535, CAS# 75-59-2

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TESTING CONDITIONS:

Standard Test Method Used: ASTM F739-20
 Permeation Cell Size: 2" Permeation Test Cell
 Analytical Method: UV/VIS Spectrometer; pH Measurement; Gas Chromatography (GC/FID)
 Testing Temperature: 27.0°C ± 1.0
 Sample Conditioning: 24hrs. at 27°C / 36% Relative Humidity
 Collection System: Closed Loop (UV/VIS; pH) / Gas Chromatography (GC/FID)
 Specimen Area Exposed: 18.726 cm²
 Selected Data Points: 10-49/ test depending on the sample and/or technique

COLLECTION MEDIA:

Table 2.1 Collection Media for Test Chemical

TEST CHEMICAL	COLLECTION MEDIUM
Acetone	Distilled Water
Ammonium Fluoride 40%	Distilled Water
Ammonium Hydroxide 28-30%	Distilled Water
Acetic Acid 99%	Distilled Water
N-Butyl Acetate	Helium
Citric Acid 10-15%	Distilled Water
Ethyl Acetate	Helium
Ethanolamine	Distilled Water
Ethylene Glycol	Distilled Water
Hexamethyldisilazane (HMDS)	Distilled Water
Hydrochloric Acid 37%	Distilled Water
Hydrochloric Acid 32%	Distilled Water
Hydrofluoric Acid 48%	Distilled Water
Hydrofluoric Acid 1%	Distilled Water
Hydrogen Peroxide 30%	Distilled Water
Isopropyl Alcohol 99%	Helium
Nitric Acid 70%	Distilled Water
Phosphoric Acid 85%	Distilled Water
Potassium Hydroxide 10-50%	Distilled Water
Propylene glycol monomethyl ester acetate	Distilled Water
Sodium Hydroxide 50%	Distilled Water
Sulfuric Acid 96%	Distilled Water
Sodium Hypochlorite 10-13%	Distilled Water
Tetramethylammonium hydroxide	Distilled Water

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DETECTION METHOD OF CHEMICAL PERMEATION:**UV/VIS ABSORPTION SPECTROMETRY:**

Instrument: Perkin Elmer UV/VIS Spectrometer Lambda 25

UV/VIS Absorption Spectrometry was used to measure the absorbance of test chemicals, which permeated through the specimens into the collection medium. The collection medium was circulated in a closed loop through the testing period. Data collection was performed according to the programmed schedule by means of UV Winlab software from the Perkin Elmer Corporation. The list of the characteristic wavelengths is shown below.

Table 3.1 Characteristic Wavelengths used in UV/VIS Absorption Spectrometry

TEST CHEMICAL	WAVELENGTH (nm)
Acetone	264
Ammonium Fluoride 40%	196
Ethanolamine	192
Ethylene Glycol	191
Hexamethyldisilazane	197
Hydrogen Peroxide 30%	191
Propylene glycol monomethyl ester acetate	191
Sodium Hypochlorite 10-13%	292

GAS CHROMATOGRAPHY (GC/FID):

Instrument: Perkin Elmer Clarus 500 Gas Chromatograph with Autosampler*
 Column: Zebtron ZB-5 7HM-G002-11 (30m x 0.32mm I.D. x 0.25mm)
 Detector: FID

GC was run at specific conditions to separate and measure the amount of permeated test chemical throughout the testing period.

* For gas sampling, an ARNEL multi-permeation chamber analyzer was used.

POTENTIOMETRY (pH MEASUREMENT):

Instruments: Oakton pH/mV/°C Meter; Cole-Parmer pH/mV/°C Meter
 Electrodes: Oakton "2 in 1" pH Glass Electrode

The pH of the collection medium was measured for the acidic and basic test chemicals. Dual point standardization was performed for pH 7 and pH 4 or pH 10. Automatic Temperature Compensator (ATC) automatically compensated temperature change of the system during the test.

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SAMPLE CHARACTERISTICS:

Table 4.1 Thickness characteristics for the tested: Personal Protection VR Gown Blue with Elastic Cuffs, Size Regular, Gauge 4 mil.

TEST CHEMICAL	Thickness (mm)			Average (mm)
	Sample 1	Sample 2	Sample 3	
Acetone	0.119	0.115	0.118	0.118
Ammonium Fluoride 40%	0.121	0.112	0.120	0.118
Ammonium Hydroxide 28-30%	0.121	0.113	0.120	0.118
Acetic Acid 99%	0.123	0.111	0.119	0.118
N-Butyl Acetate	0.117	0.114	0.118	0.116
Citric Acid 10-15%	0.123	0.115	0.115	0.118
Ethyl Acetate	0.126	0.114	0.118	0.119
Ethanolamine	0.126	0.115	0.115	0.118
Ethylene Glycol	0.120	0.115	0.114	0.117
Hexamethyldisilazane (HMDS)	0.116	0.120	0.118	0.118
Hydrochloric Acid 37%	0.121	0.116	0.115	0.118
Hydrochloric Acid 32%	0.121	0.115	0.115	0.117
Hydrofluoric Acid 48%	0.119	0.113	0.116	0.116
Hydrofluoric Acid 1%	0.121	0.112	0.114	0.116
Hydrogen Peroxide 30%	0.122	0.112	0.115	0.116
Isopropyl Alcohol 99%	0.122	0.112	0.117	0.117
Nitric Acid 70%	0.120	0.114	0.115	0.116
Phosphoric Acid 85%	0.121	0.115	0.115	0.117
Potassium Hydroxide 10-50%	0.123	0.113	0.115	0.117
Propylene glycol monomethyl ester acetate	0.120	0.114	0.116	0.117
Sodium Hydroxide 50%	0.121	0.114	0.116	0.117
Sulfuric Acid 96%	0.121	0.112	0.116	0.116
Sodium Hypochlorite 10-13%	0.125	0.113	0.116	0.118
Tetramethylammonium hydroxide	0.121	0.113	0.116	0.117
Weight/Unit Area (g/m²)	101			

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RESULTS:

Table 5.1 Permeation Test Results on testing of: Personal Protection VR Gown Blue with Elastic Cuffs, Size Regular, Gauge 4 mil.

TEST CHEMICAL	AVERAGE BREAKTHROUGH DETECTION TIME (Specimen 1/2/3) (Minutes)	AVERAGE STANDARDIZED BREAKTHROUGH DETECTION TIME (Specimen 1/2/3) (Minutes)	AVERAGE CUMULATIVE PERMATION (Specimen 1/2/3) (µg/cm²)	AVERAGE STEADY STATE PERM. RATE (Specimen 1/2/3) (µg/cm²/min)	OTHER OBSERVATIONS
Acetone	10 (10, 10, 10)	10 (10, 10, 10)	2.0 (2.1, 2.0, 1.8)	1.2E ⁺⁰¹ (1.3E ⁺⁰¹ , 1.2E ⁺⁰¹ , 1.1E ⁺⁰¹)	Slight Swelling
Ammonium Fluoride 40%	>480 min.	>480 min.	<0.1	N/A	No Swelling
Ammonium Hydroxide 28-30%	10.0 (10.0, 10.0, 10.0)	10.3 (10.4, 10.5, 10.7)	3.7 (3.0, 4.2, 3.8)	3.0 (3.6, 2.7, 2.6)	Slight Swelling
Acetic Acid 99%	6.7 (5, 10, 5)	19.9 (15.2, 20.9, 23.7)	7.2 (1.2E ⁺⁰¹ , 2.9, 6.7)	4.0E ⁺⁰¹ 4.4E ⁺⁰¹ , 3.0E ⁺⁰¹ , 4.6E ⁺⁰¹)	Moderate Swelling
N-Butyl Acetate	0 (0, 0, 0)	0.6 (0.6, 0.6, 0.6)	9.9 (9.9, 1.0E ⁺⁰¹ , 9.9)	1.4E ⁺⁰¹ (1.4E ⁺⁰¹ , 1.3E ⁺⁰¹ , 1.4E ⁺⁰¹)	No Swelling
Citric Acid 10-15%	>480 min.	>480 min.	<0.1	N/A	No Swelling
Ethyl Acetate	0 (0, 0, 0)	0 (0, 0, 0)	N/A	Outside of Reading Range	No Swelling
Ethanolamine	>480 min.	>480 min.	<0.1	N/A	No Swelling
Ethylene Glycol	>480 min.	>480 min.	<0.1	N/A	No Swelling
Hexamethyldisilazane (HMDS)	20.0 (20,20,20)	20.3 (20.4,20.2,20.4)	3.0E+01 (2.4E+01,4.2E+01,2.5E+01)		No Swelling
Hydrochloric Acid 37%	>480 min.	>480 min.	<0.1	N/A	No Swelling
Hydrochloric Acid 32%	140 (140, 140, 140)	367.5 (380.0, 377.0, 410.6)	3.2 (1.0, 2.0, 6.5)	2.7 (3.2, 2.5, 2.4)	No Swelling
Hydrofluoric Acid 48%	>480 min.	>480 min.	<0.1	N/A	No Swelling
Hydrofluoric Acid 1%	>480 min.	>480 min.	<0.1	N/A	N/A
Hydrogen Peroxide 30%	>480 min.	>480 min.	<0.1	N/A	No Swelling
Isopropyl Alcohol 99%	8.0 (8.0, 8.0, 8.0)	9.4 (9.7, 9.6, 8.9)	4.9 (3.7, 4.0, 7.0)	1.8 (1.7, 1.8, 1.9)	No Swelling
Nitric Acid 70%	>480 min.	>480 min.	<0.1	N/A	No Swelling
Phosphoric Acid 85%	>480 min.	>480 min.	<0.1	N/A	N/A
Potassium Hydroxide 10-50%	>480 min.	>480 min.	<0.1	N/A	No Swelling
Propylene glycol monomethyl ester acetate	>480 min.	>480 min.	<0.1	N/A	No Swelling
Sodium Hydroxide 50%	>480 min.	>480 min.	<0.1	N/A	No Swelling
Sulfuric Acid 96%	>480 min.	>480 min.	<0.1	N/A	No Swelling
Sodium Hypochlorite 10-13%	>480 min.	>480 min.	<0.1	N/A	No Swelling
Tetramethylammonium hydroxide	>480 min.	>480 min.	<0.1	N/A	No Swelling

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SAMPLES RECEIVED:
Personal Protection VR Gown Blue with Elastic Cuffs,
Size Regular, Gauge 4 mil.



DISCLAIMER:

Photographs of samples is an ARDL procedure used for internal documentation and for reference only. Due to the process of printing and scanning a final report, there are variations of color tone in reported sample photographs. Blues, purples and greens are most effected during the printing process.

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APPENDIX

RULE 1.

This is the way test results have traditionally been reported by ARDL. If ARDL runs a test for you that has pass/fail requirements, ARDL will report the values observed and then state "Pass" or "Fail", based on those values only. By default, ARDL will apply this rule to all Category I tests and those tests which are not on ARDL's Scope of Accreditation.

RULE 2.


This rule takes into account the calculated measurement uncertainty of test results generated. Every test and piece of test equipment has an inherent amount of measurement uncertainty associated with it. Rule 2 establishes "Guard Bands", where the measurement uncertainty value is added to the Minimum Passing requirement and is subtracted from the Maximum Passing requirement. The Pass/Fail requirements thus become tighter and customers may be more "Certain" of their Pass/Fail result.


RULE 3.

This rule also takes into account measurement uncertainty but does not set up guard bands. Rule 3 may be used when values are reported, but there is no Pass/Fail requirement called out in the test specification. Rule 3 simply states that the measurement uncertainty is reported to the customer, along with the testing result generated, and the customer decides if the results are suitable for their purposes.

REPORT REVISIONS:

<u>DATE</u>	<u>REVISION #</u>	<u>DETAILS</u>
10/16/24	N/A	Original Final Report

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