Chemical Permeation Testing

Chemical permeation is the process by which chemicals migrate through protective glove material at the molecular level. It is important to note that chemical permeation can occur without any physical or observable changes to the glove material. To be better informed about selecting gloves when working with chemicals, it is important to understand how chemical permeation is tested and measured.

TESTING OVERVIEW

Chemical permeation tests are completed in laboratory conditions where a sample of glove material is placed in a 2-sided chamber. One side of the chamber is filled with the test chemical, the other side with collection medium where measurements are taken to determine the level of chemical permeation over a period of time (480 minutes) and at a fixed temperature (~21°C/69°F).

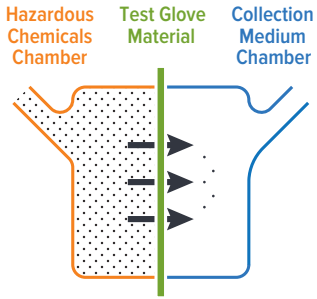

Illustration of chemical testing chamber

Disclaimer: Chemical permeation tests are conducted in controlled laboratory conditions and not in field conditions. Testing cannot replicate specific wear and tear environments under actual application conditions. The information included is provided as a guide only. Using the correct gloves, for specific applications can only by determined by testing in those applications by the purchaser.

TESTING RESULTS KEY

Chemical Permeation (ANSI)		NewTrile™			
Model Number		NU11-RD-ECO-GR			
Palm Thickness		0.28 mm / 11 mil			
Test Method		ASTM F739-12e1			
Chemical	CAS Number	Average BTT (min)	Rating	Degradation %	Recommendation
ORGANIC ACIDS					
Acetic Acid - Glacial	64-19-7	7	0	95.1	
Acetic Acid, 10%	64-19-7	>480	6	13.3	
Acetic Acid, 20%	64-19-7	>480	6	15.4	
Acetic Acid, 25%	64-19-7	>480	6	22.7	
INORGANIC ACID					
Hydrochloric Acid, 10%	7647-01-0	>480	6	10.8	
Hydrochloric Acid, 37%	7697-37-2	67	3	21.9	
Nitric Acid, 40%	7697-37-2	256	5	18.2	
Nitric Acid, 10%	7697-37-2	>480	6	3.8	
Nitric Acid, 65%	7664-38-2	29	1	98.7	
Sulphuric Acid, 40%	7664-93-9	>480	6	20.5	
Sulphuric Acid, 50%	7664-93-9	>480	6	22.5	
Sulphuric Acid, 96%	8007-56-5	29	1	88.1	
ALKALIS					
Ammonium Hydroxide, 25%	1336-21-6	>480	6	46.7	
Potassium Hydroxide, 50%	1310-58-3	>480	6	-21	
Sodium Hydroxide, 40%	1310-73-2	>480	6	-9.6	
Sodium Hydroxide, 20%	1310-73-2	>480	6	-28.5	

Breakthrough Times (BTT): The ***elapsed time*** between initial contact of the test chemical with the outside surface of the glove and the time at which permeation rate reaches 1µg/cm2/min (ASTM F739-12). A higher number is better or longer.

Rating: The ANSI/ISEA 105-2016 numerical classification for chemical permeation.

Degradation %: The percentage change in the puncture resistance of the glove material after a continuous contact with the external surface with the challenge chemical compared to the puncture resistance of the glove material before exposure (ANSI/ISEA 105-2016). A lower number is better.

Recommendation: The destructive change in one or more properties of a material. These are rated on a ***color-coded scale*** (see table below).

Rating is based on Breakthrough Time (BTT)

Average BTT (min)	Rating
7	0
>480	6
>480	6
>480	6
≥ 240	5
≥ 480	6
67	3
256	5

Recommendation Criteria

Color Coding Criteria			
BTT (min)	Degradation %	Physical Changes	Recommendation
>30	0-60%	No	Recommended
>10	61-90%	No	Fair
<10	>90%	Yes	Not Recommended

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SW® NewTrile™ Chemical Permeation Testing Guide - ANSI, ASTM F739-12e1

NEWTRILE™

R Recommended | F Fair | NR Not Recommended

Chemical Permeation (ANSI)		NewTrile™				NewTrile™				NewTrile™			
Model Number		NU11-RD-ECO-GR				NU15-RD-ECO-GR				NF15-RD-ECO-GR			
Palm Thickness		0.28 mm / 11 mil				0.38 mm / 15 mil				0.38 mm / 15 mil			
Test Method		ASTM F739-12e1				ASTM F739-12e1				ASTM F739-12e1			
Chemical	CAS Number	Average BTT (min)	Rating	Degradation %	Recommendation	Average BTT (min)	Rating	Degradation %	Recommendation	Average BTT (min)	Rating	Degradation %	Recommendation
ORGANIC ACIDS													
Acetic Acid - Glacial	64-19-7	7	0	95.1		25	1	95.1		75	3	91.9	
Acetic Acid, 10%	64-19-7	>480	6	13.3		>480	6	13.3		>480	6	11.2	
Acetic Acid, 20%	64-19-7	>480	6	15.4		>480	6	15.4		>480	6	13.8	
Acetic Acid, 25%	64-19-7	>480	6	22.7		>480	6	22.7		>480	6	2.2	
INORGANIC ACID													
Hydrochloric Acid, 10%	7647-01-0	>480	6	10.8		>480	6	10.8		>480	6	12.8	
Hydrochloric Acid, 37%	7697-37-2	67	3	21.9		90	3	20.1		>480	6	11.4	
Nitric Acid, 10%	7697-37-2	>480	6	3.8		>480	6	3.8		>480	6	10.2	
Nitric Acid, 40%	7697-37-2	256	5	18.2		340	5	18.0		>240	3	14.1	
Nitric Acid, 65%	7664-38-2	29	1	98.7		40	2	98.0		46	2	98.7	
Sulphuric Acid, 40%	7664-93-9	>480	6	20.5		>480	6	20.5		>480	6	14.2	
Sulphuric Acid, 50%	7664-93-9	>480	6	22.5		>480	6	22.5		>480	6	7.1	
Sulphuric Acid, 96%	8007-56-5	29	1	88.1		40	2	86.7		89	3	58.9	
ALKALIS													
Ammonium Hydroxide, 25%	1336-21-6	>480	6	46.7		>480	6	46.7		>480	6	31.3	
Potassium Hydroxide, 50%	1310-58-3	>480	6	-21		>480	6	-21		>480	6	4.7	
Sodium Hydroxide, 20%	1310-73-2	>480	6	-28.5		>480	6	-28.5		>480	6	-2.4	
Sodium Hydroxide, 40%	1310-73-2	>480	6	-9.6		>480	6	-9.6		>480	6	4.5	
Sodium Hydroxide, 50%	1310-73-2	>480	6	-13.4		>480	6	-13.4		>480	6	1.6	
ALCOHOLS													
Butanol	71-36-3	230	4	34.2		315	5	34.2		>480	6	36.1	
Ethanol, 96%	64-17-5	>480	6	54.1		>480	6	54.1		>480	6	15.3	
Iso Propyl Alcohol (Propan-2-ol)	67-63-0	>480	6	20.2		>480	6	20.2		>480	6	24.8	
Methanol	67-56-1	7	0	81.7		10	1	80.0		12	1	70.1	
Propane - 1 - ol	71-23-8	>480	6	19.5		>480	6	18.0		>480	6	26.5	
KETONES													
Acetone	67-64-1	<5	0	91.3		<5	0	91.3		<5	0	92.1	
Cyclohexanone	108-94-1	7	0	96.8		15	0	96.8		45	2	96.1	
Methyl ethyl ketone	78-93-3	<5	0	84.3		<5	0	84.3		<5	0	84.0	
Methyl Propyl ketone	107-87-9	<5	0	100.0		<5	0	100.0		<5	0	97.2	
ALDEHYDES													
Formaldehyde, 37%	50-00-0	>480	6	12.0		>480	6	12.0		>480	6	-15.6	
ESTERS													
Ethyl Acetate	141-78-6	<5	0	89.3		<5	0	89.3		<5	0	91.5	
ALIPHATIC SOLVENTS													
Cyclohexane	110-82-7	>480	6	20.4		>480	6	20.4		>480	6	11.1	
n - Hexane	110-54-3	>480	6	4.8		>480	6	4.8		>480	6	-10.2	
n- Heptane	142-82-5	100	3	30.4		150	4	30.4		>480	6	15.5	
AROMATIC SOLVENTS													
Toluene	108-88-3	<5	0	87.1		<5	0	87.1		<5	0	81.8	
Xylene	1330-20-7	<5	0	74.3		<5	0	74.3		<5	0	80.5	
Thinner	108-88-3	<5	0	90.8		<5	0	90.8		<5	0	96.4	
AMINES													
Diethyl Amine	109-89-7	<5	0	100.0		<5	0	100.0		<5	0	93.3	
CHLORINATED SOLVENTS													
Dichloromethane	75-09-2	<5	0	98.3		<5	0	98.3		<5	0	99.3	
PEROXIDES													
Hydrogen Peroxide, 30%	7722-84-1	>480	6	22.2		>480	6	22.2		>480	6	-11.7	

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