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Att.: Nicole Miller

Date  
October 10, 2013  
Your ref.:  
Our ref.: G23665Rev1/JH

## Test report

### Sample material

Sample identification	Chemical Protective Glove: Lab no. G2366501: Nitril BestGen
Test Chemical	40% sodium hydroxide, Methanol and n- Heptane as challenge chemical Monitoring breakthrough of 40% sodium hydroxide continuously with pH - meter and Methanol and n-Heptane is monitored continuously by GC/FID.
Receipt of samples	August 19, 2013
Analytical period	September 2 – October 10, 2013

### Applied methods

Method	Parameter	Break through LOQ value	Um ①
EN 374-3	Permeation rate and break through defined as 1 µg/cm <sup>2</sup> /minute	0.01 µg/cm <sup>2</sup> /min.	20%
ASTM F739	Permeation rate and break through defined as 0.1 µg/cm <sup>2</sup> /minute	0.01 µg/cm <sup>2</sup> /min.	20%

#### Principle:

The protective glove was fixed between the two compartments of a standard permeation cell. The outer side of the glove in test was covered with a solution of the challenge chemical – hence the glove was exposed continuously. The whole test area of 19.4 cm<sup>2</sup> was exposed. The cell temperature was kept at 23 °C through out the test.

#### Method GC/FID:

The internal side of the cell was flushed with synthetic air as collection medium in an open loop and the permeation of volatile organic solvents was monitored continuously by passing part of the collection medium to a flame ionisation detector (FID), calibrated against toluene. For determination of permeation rate the substance specific response factor was applied. This method was applied to the challenge chemical n-Heptane and Methanol.

#### Method for detecting the test chemical 40% sodium hydroxide:

The internal side of the cell was flushed with water as collection medium in a closed loop and the permeation of sulphuric acid and 40% sodium hydroxide was monitored continuously by pH and conductivity electrode placed in the loop.

The determination has been carried out in triplicate.

① U<sub>m</sub> (%): The expanded uncertainty U<sub>m</sub> is equal to 2 x RSD%, see also [www.eurofins.dk](http://www.eurofins.dk). Keyword: Uncertainty

## Test Result

Test results are summarised in table 1 below. See detailed results on the following pages. Test data and results for protective glove Nitril NextGen no 171070412 are reported below in table 2 to 7 and the permeation recordings in figure 1 to figure 3

# Analytical results

Tabel 1. Permeation test results

Glove:			Nitril BestGen			
			Breakthrough time		Permeation rate at steady state	Performance level
			EN 374-3	ASTM F739	ASTM F739	EN 374-1
No.	Challenge chemical / product tested	CAS	Min	Min	$\mu\text{g} / \text{cm}^2 / \text{min}.$	
1	40% sodium hydroxide	1310-73-2	> 480	> 480	< 0.01	<b>6</b>
2	Methanol	67-56-1	1	1	70	<b>0</b>
3	n-Heptane	142-82-5	40	23	1.6	<b>2</b>

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John Hansen  
MSc. Chemistry

Picture of sample



The test results relate only to the items tested.  
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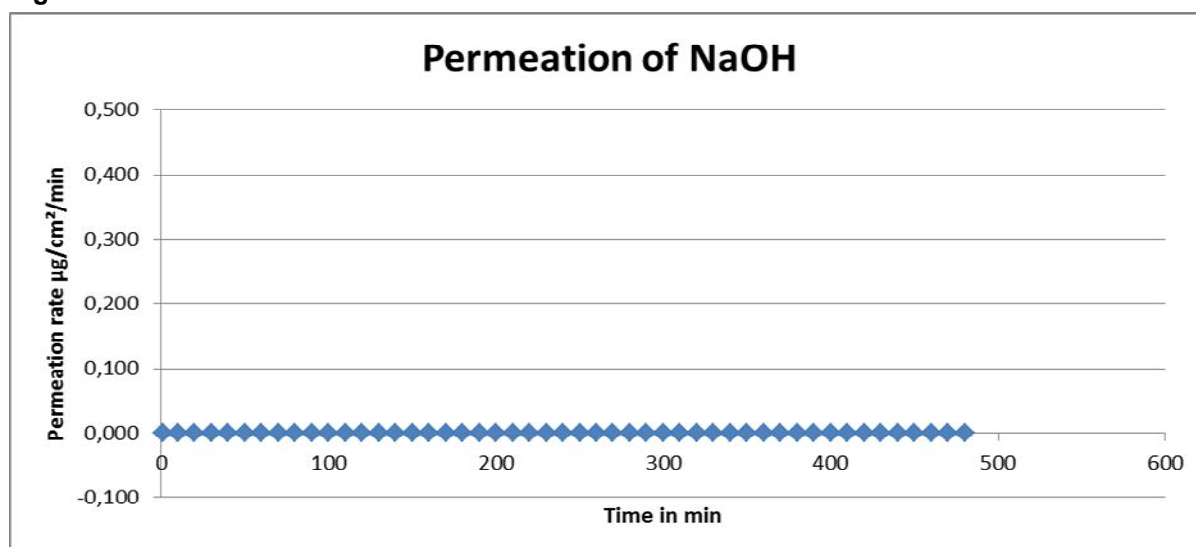
# Analytical results

**Table 2. Test Conditions Sodium hydroxide**
**Test Conditions**

Test chemical		Test parameters	
Challenge chemical	Sodium hydroxide	Collection system	Closed loop
Cas no.:	1310-73-2	Contact type	Continuous
Supplier/Product	Merck - 1.06498	Collection media	Water
Purity/concentration	>99%/40%	Collection volume	140 ml
Chemical state	Liquid	Analytical method	pH monitoring
<b>Glove sample</b>		Sampling frequency	1 minutes
Brand	Nitril BestGen	Test temperature	23 °C
Type	Nitril	Test duration	500 minutes
Condition	New single layer	Minimum detection rate	0.01 µg/cm <sup>2</sup> /min.
Glove area exposed	19.5 cm <sup>2</sup>	Calibration	Buffer solution pH 7.01 and 4.00
Thickness in mm			
Weight/area in g/m <sup>2</sup>			

**Table 3. Results, Sodium hydroxide:**

Sample	Nitril BestGen			
Cell no.	1	2	3	Mean
Breakthrough ASTM (minutes)	> 480	> 480	> 480	> 480
Breakthrough EN (minutes)	> 480	> 480	> 480	> 480
Permeation rate steady state µg/cm <sup>2</sup> /min.				< 0.01
Performance level EN				6
Post test condition	No visual changes			

**Figure 1. Permeation curve**


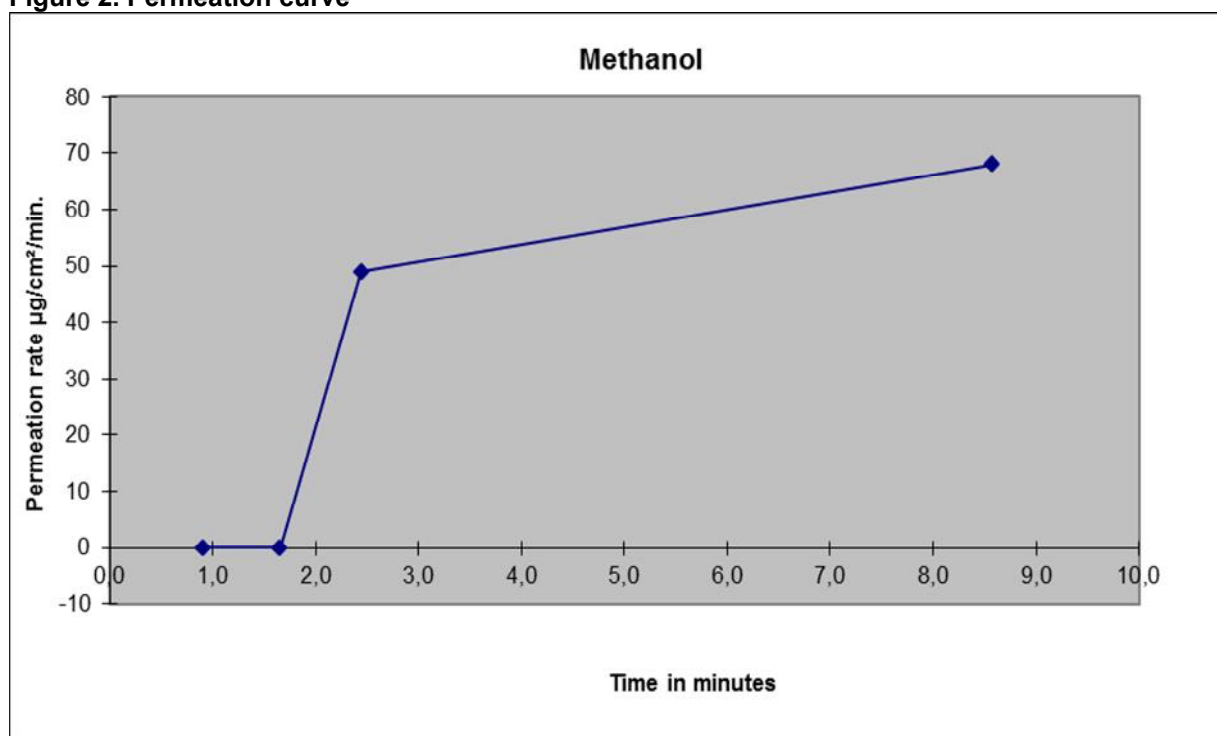
# Analytical results

**Tabel 4. Test Conditions**

Test chemical		Test parameters	
Challenge chemical	Methanol	Collection system	Open loop
Cas no.:	67-56-1	Contact type	Continuous
Supplier/Product	Fluka 34966	Collection media	Syntetic air
Purity/concentration	99.9 %	Collection flow rate	0.24 l/min.
Chemical state	Liquid	Analytical method	GC/FID
<b>Glove sample</b>		Sampling frequency	1 – 5 minutes
Brand	Nitril BestGen	Test temperature	23 °C
Type	Nitril	Test duration	10 minutes
Condition	New single layer	Minimum detection rate	0.01 µg/cm <sup>2</sup> /min.
Glove area exposed	19.5 cm <sup>2</sup>	Calibration	Toluene 38.8 µg/l
Thickness in mm			
Weight/area in g/m <sup>2</sup>			

**Tabel 5. Results, Permeation of Methanol:**

Sample	Nitril BestGen			
	1	2	3	Mean
Cell no.				
Breakthrough ASTM (minutes)	2	1	1	1
Breakthrough EN (minutes)	2	1	1	1
Permeation rate steady state µg/cm <sup>2</sup> /min.				70
Performance level EN				0
Post test condition	No visual changes			

**Figure 2. Permeation curve**


# Analytical results

**Tabel 6. Test Conditions**

Test chemical		Test parameters	
Challenge chemical	n-Heptane	Collection system	Open loop
Cas no.:	142-82-5	Contact type	Continuous
Supplier/Product	Sigma Aldrich 37873	Collection media	Syntetic air
Purity/concentration	99 %	Collection flow rate	0.24 l/min.
Chemical state	Liquid	Analytical method	GC/FID
<b>Glove sample</b>		Sampling frequency	1 - 5 minutes
Brand	Nitril BestGen no 171070412	Test temperature	23 °C
Type	Nitril	Test duration	60 minutes
Condition	New single layer	Minimum detection rate	0.01 µg/cm <sup>2</sup> /min.
Glove area exposed	19.5 cm <sup>2</sup>	Calibration	Toluene 38.8 µg/l
Thickness in mm			
Weight/area in g/m <sup>2</sup>			

**Tabel 7. Results, Permeation of n-Heptane:**

Sample	Nitril BestGen			
	1	2	3	Mean
Cell no.				
Breakthrough ASTM (minutes)	24	23	21	23
Breakthrough EN (minutes)	40	42	37	40
Permeation rate steady state µg/cm <sup>2</sup> /min.				1.6
Performance level EN				2
Post test condition	Color slightly faded			

**Figure 3. Permeation curve**
