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Date
20 February 2015

EMICODE Test Report

1 Sample Information

Sample identification	Würth IPT
Batch no.	-
Production date	-
Product type	Joint sealant
Date when sample was received	05/11/2012
Testing (start - end)	07/11/2012 – 05/12/2012

2 Evaluation of the Results

The tested product complies with the requirements of GEV and the results correspond to the EMICODE emission class EC 1$^{\text{PLUS}}$

Parameter	**Concentration** µg/m³	**EC 2** µg/m³	**EC 1** µg/m³	**EC 1$^{\text{PLUS}}$** µg/m³
TVOC$_{\text{3 days}}$	7.7	≤ 3000	≤ 1000	≤ 750
TVOC$_{\text{28 days}}$	< 5	≤ 300	≤ 100	≤ 60
TSVOC$_{\text{28 days}}$	< 5	≤ 100	≤ 50	≤ 40
Total VOC without NIK $_{\text{28 days}}$	< 5	> 40		≤ 40
R-value (dimensionless)	< 1	> 1		≤ 1
Formaldehyde$_{\text{3 days}}$	< 3	≤ 50		
Acetaldehyde$_{\text{3 days}}$	< 3	≤ 50		
Sum formaldehyde and acetaldehyde after 3 days	< 0.002 ppm	≤ 0.05 ppm		
Total Carcinogens$_{\text{3 days}}$	< 1	≤ 10		
Total Carcinogens$_{\text{28 days}}$	< 1	≤ 1		

This test report does not alone entitle to use the protected trademark label EMICODE. For the use of an EMICODE label a license has to be applied for at the GEV, Düsseldorf, Germany. A license can only be granted for ready-to use products, if some additional requirements on contents of certain chemicals (e.g. solvent-free) are fulfilled.

Note: The label is supplemented with a final letter R (e.g. EMICODE EC 1 R) for installation products that fulfill the specification in clause 3.1.2 sentence 2 of GEV classification criteria and that therefore may require measures for ensuring occupational safety during application.

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3 Test Method

Method	**Principle**	**Parameter**	**Quantification limit**	**Uncertainty**
GEV method in its current version of 23.02.2011.				
Internal method numbers: 9810, 9811, 9812, 2808, 8400	GC/MS	VVOC, VOC, SVOC	1 µg/m³	22% (RSD) U_m = 2 x RSD= 45 %
	GC/MS	TVVOC, TVOC, TSVOC	5 µg/m^3	
	HPLC	Volatile Aldehydes	4 µg/m^3	

Test chamber parameter

Chamber volume, l	119	Temperature, °C	23±1	Relative humidity, %	50±5
Air exchange rate, 1/h	0.5	Loading ratio, m²/m³	0.1	Results were recalculated to a loading ratio of 0.007 m²/m³	

Sample preparation

The sample was homogenised and applied onto a glass plate and drawn off over a model giving a 3 mm thick and uniform layer with a broadness of 10 mm.

Deviations from the test method: None

For detailed method description see page 6: 4.4 Description of the applied test method

4 Results

4.1 Emissions Test after 3 Days

	CAS No.	Retention time min	ID-Cat	Concen-tration µg/m^3	NIK-value µg/m^3	R- value	Emission rate µg/(m^2*h)	Toluene equivalent µg/m^3
TVOC (C_6-C_{16})				7.7	-	-	550	7.7
VOC with NIK								
Butylacrylate	141-32-2	6.75	2	7.7	110	1.0	550	7.7
R-value = Σ Conc$_i$/NIK$_i$						1.0		
VOC without NIK								
n.d.	-	-	-	< 5	-	-	< 400	< 5
Total VOC without NIK				< 5	-	-	< 400	< 5
Total VVOC (< C_6)				< 5	-	-	< 400	< 5
n.d.	-	-	-	< 5	-	-	< 400	< 5
Total SVOC (> C_{16})				< 5	-	-	< 400	< 5
n.d.	-	-	-	< 5	-	-	< 400	< 5
Total Carcinogens				< 1	-	-	< 100	< 1
n.d.	-	-	-	< 1	-	-	< 100	< 1
Volatile Aldehydes C_1-C_6 measured with DNPH-Method and Ammonia								
Formaldehyde	50-00-0	-	-	**< 3**	120	-	< 300	-
Acetaldehyde	75-07-0	-	-	< 3	-	-	< 300	-
C_3 – C_6 Aldehydes	-	-	-	< 3	-	-	< 300	-
Ammonia	7664-41-7	-	-	< 3	-	-	< 300	-

n.d.	Not detected
<	Means less than
*	Not a part of our accreditation. See 4.4.6 Accreditation

4.2 Emissions Test after 28 Days

	CAS No.	Retention time min	ID-Cat	Concen-tration µg/m³	NIK-value µg/m³	R- value	Emission rate µg/(m²*h)	Toluene equivalent µg/m³
TVOC (C_6-C_{16})				< 5	-	-	< 400	< 5
VOC with NIK								
n.d.	-	-		< 5	-	-	< 400	< 5
R-value = Σ $Conc_i/NIK_i$						< 1		
VOC without NIK								
n.d.	-	-	-	< 5	-	-	< 400	< 5
Total VOC without NIK				< 5	-	-	< 400	< 5
Total VVOC (< C_6)				< 5	-	-	< 400	< 5
n.d.	-	-	-	< 5	-	-	< 400	< 5
Total SVOC (> C_{16})				< 5	-	-	< 400	< 5
n.d.	-	-	-	< 5	-	-	< 400	< 5
Total Carcinogens				< 1	-	-	< 100	< 1
n.d.	-	-	-	< 1	-	-	< 100	< 1
Volatile Aldehydes C_1-C_6 measured with DNPH-Method (see 4.4.4)								
Formaldehyde	50-00-0	-	-	< 3	120	-	< 300	-
Acetaldehyde	75-07-0	-	-	< 3	-	-	< 300	-
C_3 – C_6 Aldehydes	-	-	-	< 3	-	-	< 300	-
Ammonia	7664-41-7	-	-	< 3	-	-	< 300	-

n.d.	Not detected
<	Means less than
*	Not a part of our accreditation. See 4.4.6 Accreditation

Categories of Identity:

1: Identified and specifically calibrated

2: Identified by comparison with a mass spectrum obtained from library and supported by other information. Calibrated as toluene equivalent

3: Identified by comparison with a mass spectrum obtained from a library. Calibrated as toluene equivalent

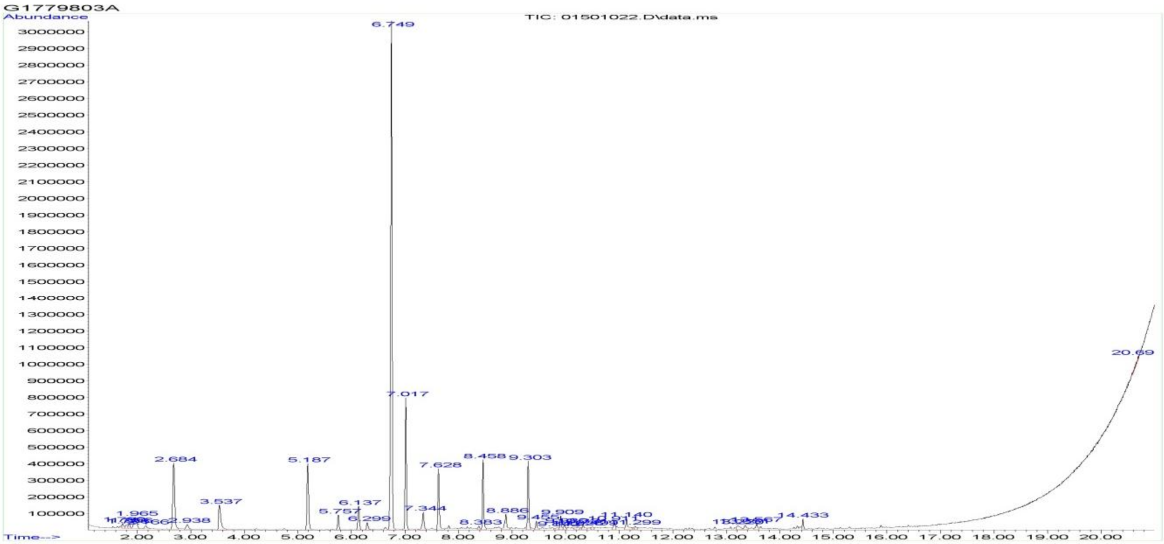
4: Not identified, calibrated as toluene equivalent

Thomas Bjerring
Analytical Service Manager

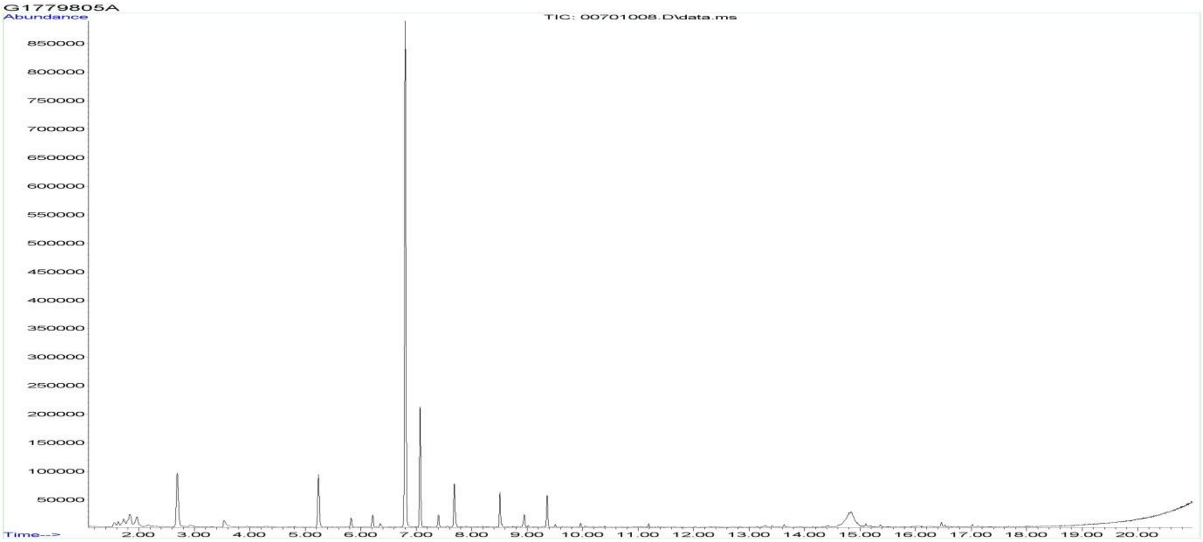
Søren Ryom Villadsen
Analytical Service Manager

4.3 Chromatograms

4.3.1 Chromatogram after 3 days



4.3.2 Chromatogram after 28 days



Please consider the different scales

4.4 Description of the applied test method

4.4.1 Test Chamber

The test chamber is made of stainless steel. A multi-step air clean-up is performed before loading the chamber, and a blank check of the empty chamber is performed. The operation parameters are 23 °C, 50 % relative air humidity in the supply air.

4.4.2 Sampling, Desorption, Analysis

Testing for Carcinogens

The presence of carcinogens (EU Categories C1 and C2, as per the latest publication on the homepage of German BGIA Institute) was tested by drawing sample air from the chamber outlet through 2 Tenax TA tubes (main tube and backup tube). Analysis was performed by thermal desorption (Perkin Elmer) and gas chromatography / mass spectroscopy (30 m column, 0.25 mm ID, 0.25 µm HP-1 film, Agilent) (internal methods no.: 9812 / 2808). The absence of a listed carcinogen was stated if the specific combination of fragment ions was absent at the specific retention time in the chromatogram. If no listed carcinogens were found but the required detection limit was exceeded, the identity was checked by comparing full scan sample mass spectra with full scan standard mass spectra.

This test covered only substances that can be adsorbed on to Tenax TA and that can be thermally desorbed. If other emissions occurred, then these substances cannot be detected (or with limited reliability only).

VOC Emissions Testing

The emissions of organic compounds were tested by drawing sample air from the chamber outlet through 2 Tenax TA tubes (main tube and backup tube). Analysis was performed by thermal desorption (Perkin Elmer) and gas chromatography / mass spectroscopy (30 m column, 0.25 mm ID, 0.25 µm HP-1 film, Agilent) (internal methods no.: 9812 / 2808).

All single substances that are listed with a NIK value in the latest AgBB publication were identified. Quantification was done with the respective response factor and the TIC signal or in case of overlapping peaks by calculating with fragment ions. All other single substances, as well as all non-identified substances, were quantified as toluene equivalent.

The results of the individual substances were calculated in three groups depending on their appearance in a gas chromatogram when analysing with a non-polar column (HP-1):

- Volatile organic compounds VOC: All substances appearing between these limits.
- Semi-volatile organic compounds SVOC: All substances appearing after n-hexadecane (n-C16).
- Very volatile organic compounds VVOC: All substances appearing before n-hexane (n-C6).

Calculation of the TVOC (Total Volatile Organic Compounds) was performed according to the AgBB/DIBt test method, by addition of the results of all individual substances with concentrations ≥ 5 µg/m^3 in the retention time interval C6-C16. Furthermore the TVOC was calculated as the toluene equivalent, as defined in ISO 16000-6.

Calculation of the TSVOC (Total Semi-Volatile Organic Compounds) was performed by addition of the results of all substances with concentrations ≥ 5 µg/m^3 between C16 and C22 as toluene equivalent, as defined in ISO 16000-6.

Calculation of the TVVOC (Total Very Volatile Organic Compounds) was performed by addition of the results of all substances with concentrations ≥ 5 µg/m^3 appearing before C6 as toluene equivalent, as defined in ISO 16000-6.

This test covered only substances that can be adsorbed on Tenax TA and that can be thermally desorbed. If other emissions occurred then these substances cannot be detected (or with limited reliability only).

4.4.3 Calculation of R Values with the German NIK List

The concentrations of all substances ≥ 5 µg/m^3 in the interval between n-C6 and n-C16 were divided by their respective NIK value (if given). The sum of the quotients gives the R value:

$$R = \sum_{i}^{n} \left({}^{c_i}\!/\!{}_{\mathrm{NIK}_I} + \ldots + {}^{c_n}\!/\!{}_{\mathrm{NIK}_n} \right)$$

In addition, all results were summed up for the substances without published NIK value, but in the interval be-tween n-C6 and n-C16, when concentrations were ≥ 5 µg/m^3

4.4.4 Testing of Aldehydes after 28 Days

The presence of aldehydes was tested by drawing air samples from the chamber outlet through DNPH-coated silicagel tubes. Analysis was done by solvent desorption, HPLC and UV-/diode array detection (ISO 16000-3, internal methods no.: 9812 / 8400).

The absence of formaldehyde was stated if the specific wavelength UV detector response was lacking at the specific retention time in the chromatogram. Otherwise it was checked whether the detection limit was exceeded. In this case the identity was finally checked by comparing full scan sample UV spectra with full scan standard UV spectra.

4.4.5 Quality assurance

Before loading the chamber a blank check of the empty chamber was performed and compliance with background concentrations in accordance with ISO 16000-9 was determined. Sampling at the chamber outlet and subsequent analysis was performed in duplicate. For monitoring any breakthrough or overloading of the tubes, two Tenax TA tubes were used in series.

In each sequence stability of GC system was checked by a general function test of device and column, and by use of control charts for monitoring mean values and standard deviations for individual VOCs. Reproducibility of the method was monitored for two selected VOCs per sequence.

4.4.6 Accreditation

The testing methods described above are accredited to EN ISO/IEC 17025:2005 by DANAK (no. 522). Not all parameters are covered by this accreditation. At present the accreditation does not cover the parameters marked with a note *, however analysis was performed for these parameters at the same level of quality as for the accredited parameters.

4.4.7 Uncertainty of the test method

The relative standard deviation of the test method amounts to 22% (RSD). The expanded uncertainty U_m is 45% and equals 2 x RSD%. For further information please visit www.eurofins.dk/uncertainty.