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VOC EMISSION TEST REPORT
CDPH

20 December 2023

1 Sample Information

Sample name	DOWSIL™ 813C Construction and Concrete Silicone Sealant
Batch no.	H041N8B052
Stated production date	17/08/2023
Product type	Joint sealant
Sample reception	10/11/2023

2 Brief Evaluation of the Results

Regulation or protocol	Conclusion	Version of regulation or protocol
CDPH§	Pass	CDPH/EHLB/Standard Method V1.2. (January 2017)

Full details based on the testing and direct comparison with limit values are available in the following pages
Regarding pass/fail decision rule please see appendix
§ See section 4.4 on deviations

Mads Folkjær
Analytical Chemist

Rasmus Verdier
Analytical Service Manager

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3 Applied Test Methods

3.1 General Test References

Regulation, protocol or standard	Version	Reporting limit VOC [µg/m³]	Calculation of TVOC	Combined uncertainty¤ [RSD(%)]
EN 16516	2017 + A1:2020	5	Toluene equivalents	22%
ISO 16000 -3 -6 -9 -11	2006-2022 depending on part	2	Toluene equivalents	22%
ASTM D5116-10	2010	-	-	-
CDPH	CDPH/EHLB/Standard Method V1.2. (January 2017)	2	Toluene equivalents	22%

3.2 Specific Laboratory Sampling and Analyses

Procedure	External Method	Internal SOP	Quantification limit / sampling volume	Analytical principle	Uncertainty¤ [RSD(%)]
Sample preparation	ISO 16000-11:2006, EN 16516:2017+A1:2020, CDPH:2017	71M549810	-	-	-
Emission chamber testing	ISO 16000-9:2006, EN 16516:2017+A1:2020	71M549811	-	Chamber and air control	-
Sampling of VOC	ISO 16000-6:2021, EN 16516:2017+A1:2020	71M549812	5 L	Tenax TA	-
Analysis of VOC	ISO 16000-6:2021, EN 16516:2017+A1:2020	71M542808B	1 µg/m³	ATD-GC/MS	10%
Sampling of aldehydes	ISO 16000-3:2022, EN 16516:2017+A1:2020	71M549812	35 L	DNPH	-
Analysis of aldehydes	ISO 16000-3:2022, EN 16516:2017+A1:2020	71M548400	3-6 µg/m³	HPLC-UV	10%
Sampling on Carboxen tubes	ISO 16200-1:2001	71M549812	15 L	Carboxen	-
Analysis of Carboxen tubes *	ISO 16200-1:2001	71M546081	20 µg/m³	Headspace-GC/MS	10%

4 Test Parameters, Sample Preparation and Deviations

4.1 VOC Emission Chamber Test Parameters

Parameters	Value	Sample Conditions	Value
Chamber volume, V[L]	119	Date and time of unpacking and start of sample preparation	29/11/2023 - 12:40
Air change rate, n[h^{-1}]	1.0	Preconditioning period	-
Air velocity [m/s]	0.1	Chamber test period	29/11/2023 - 13/12/2023
Area specific ventilation rate, q [m/h or $m^3/m^2/h$]	143	Analytical test period	29/11/2023 - 19/12/2023
Relative humidity of supply air, RH [%]	50 ± 3	Exposed sample area [m^2]	0.0008
Temperature of supply air, T [°C]	23 ± 1	Loading factor [m^2/m^3]	0.007
Background concentration of individual VOC's [µg/m^3]	< 2	Test scenario	Very small area
Background concentration of TVOC [µg/m^3]	< 20		

4.2 Preparation of the Test Specimen

The sample was 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.

4.3 Picture of Sample

4.4 Deviations from Referenced Protocols and Regulations

The loading factor was less than the lowest factor of 0.3 m²/m³ that CDPH method specifies for testing; CDPH method does not specify a clear loading factor in any model room. Instead, the loading factor as specified in EN 16516 was applied both during testing and for calculation of the air concentration in office and classroom.

The sampling occurred more than the 24 hours after production as specified by the CDPH method.

The handover section of the “Chain of custody” document was not completed by the client.

4.5 Air Samplings from the Test Chamber

Sampling media	Day (yyyy-mm-dd)	Time (hh:mm)	Volume [L]
11 Day, Tenax TA	2023-12-10	11:50 - 12:51	5.4
11 Day-Res, Tenax TA	2023-12-10	12:52 - 13:39	2.1
11 Day, DNPH silicagel	2023-12-10	11:47 - 13:38	37
11 Day-Res, DNPH silicagel	2023-12-10	11:48 - 13:38	37
12 Day, DNPH silicagel	2023-12-11	11:52 - 13:42	36
12 Day-Res, DNPH silicagel	2023-12-11	11:52 - 13:42	36
12 Day, Tenax TA	2023-12-11	11:53 - 12:53	5.0
12 Day-Res, Tenax TA	2023-12-11	12:53 - 13:43	2.3
14 Day, Tenax TA	2023-12-13	12:01 - 12:59	5.0
14 Day-Res, Tenax TA	2023-12-13	13:00 - 13:51	2.3
14 Day, Carboxen 1000	2023-12-13	06:58 - 09:29	15
14 Day-Res, Carboxen 1000	2023-12-13	06:59 - 09:29	15
14 Day, DNPH silicagel	2023-12-13	12:00 - 13:50	36
14 Day-Res, DNPH silicagel	2023-12-13	12:00 - 13:50	46

5 Results

5.1 VOC Emission Test Results after 11 Days

	CAS No.	Specific Conc. [µg/m³]	Specific SER [µg/(m²·h)]	Toluene eq. [µg/m³]	Toluene SER [µg/(m²·h)]
TVOC (C5-C17)tol. eq.				5.4	770
Aldehydes					
Formaldehyde	50-00-0	< 3	< 500		
Acetaldehyde	75-07-0	< 3	< 500		

5.2 VOC Emission Test Results after 12 Days

	CAS No.	Specific Conc. [µg/m³]	Specific SER [µg/(m²·h)]	Toluene eq. [µg/m³]	Toluene SER [µg/(m²·h)]
TVOC (C5-C17)tol. eq.				< 2	< 300
Aldehydes					
Formaldehyde	50-00-0	< 3	< 500		
Acetaldehyde	75-07-0	< 3	< 500		

5.3 VOC Emission Test Results after 14 Days

	CAS No.	Retention time [min]	ID-Cat	SER [µg/(m²·h)]	Classroom Conc. [µg/m³]	Office Conc. [µg/m³]	½ CREL [µg/m³]
VOC (C5-C17)							
None determined					< 3	< 4	
TVOC (C5-C17)tol. eq.				< 300	< 3	< 4	
Aldehydes							
Formaldehyde	50-00-0		1	< 500	< 5	< 6	9
Acetaldehyde	75-07-0		1	< 500	< 5	< 6	70

6 Summary and Evaluation of the Results

6.1 Comparison with Limit Values of CDPH

Parameters	Test after 14 days			
	CAS No. Single compounds	**Concentration in Classroom** [µg/m³]	**Concentration in Office Room** [µg/m³]	**½ CREL** [µg/m³]
TVOC (C5-C17)tol. eq.	-	< 3	< 4	-
Single compounds (with defined CREL values) None determined	-	-	-	-
Formaldehyde	50-00-0	< 5	< 6	≤ 9
Acetaldehyde	75-07-0	< 5	< 6	≤ 70

6.1.1 Conversion of Emission Rates to CDPH Reference Room Concentrations

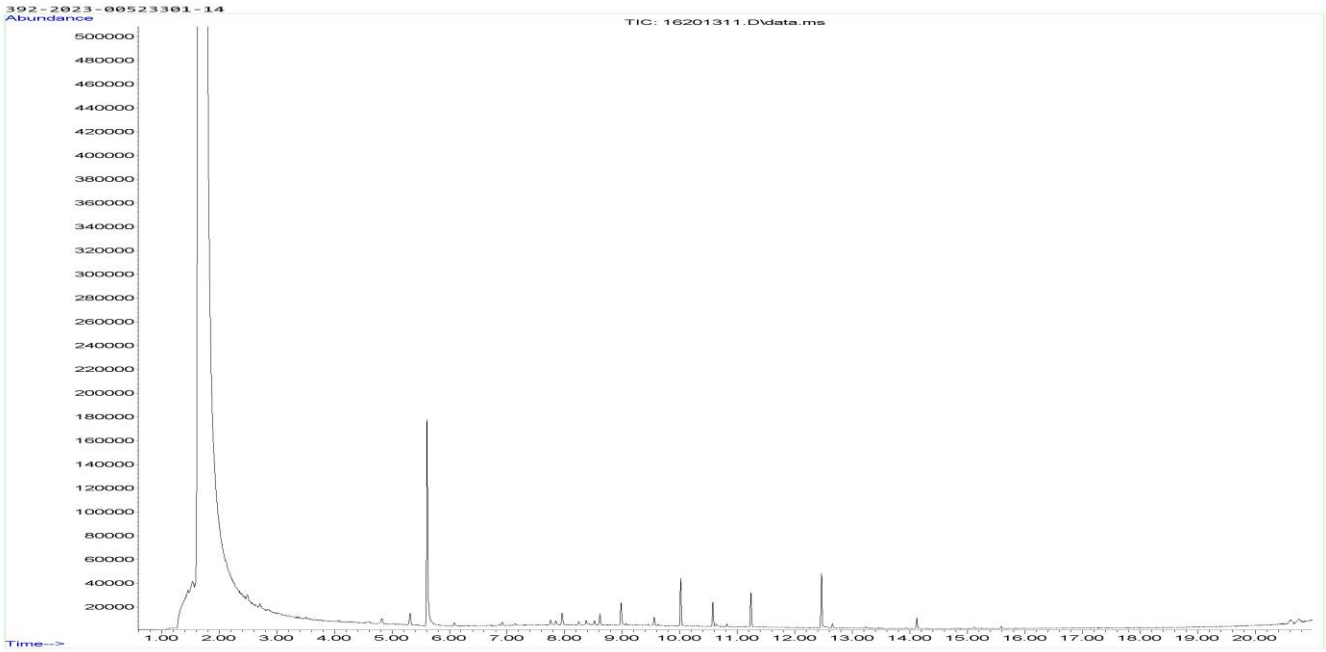
The CDPH method requires calculation of the measured emission rates into concentrations in given reference rooms. The equation and parameters figured below have been applied to calculate the concentrations in an office room or a classroom as required in the CDPH. The area used in the calculation varies depending on the expected usage of the product and therefore several entries can be found. Small and Very Small areas are not provided within the CDPH but are adapted from definitions given in EN 16516 and ISO 16000-9.

$$C_{Calculated} = \frac{SER_A \cdot A}{n \cdot V}$$

		Classroom parameters	**Office Room parameters**
SER	Area specific emission rate, µg/(m²h)	As tested	As tested
n	Air change, h^{-1}	0.82	0.68
V	Volume of reference room, m³	231	30.6
A	Floor area, m²	89.2	11.1
	Walls area, m²	94.6	33.4
	Ceiling and Wall, m²	183.8	N/A
	Door and Millwork, m²	1.89	1.89
	Desk or Chair, units	27	1
	Very Small areas, m²	1.62	0.021
	Small areas, m²	11.55	1.53

7 Appendices

7.1 Chromatogram of VOC Emissions after 14 Days



7.2 Chain of Custody

Combined Sampling Report and Chain of Custody			
Name of applicant: (name, company, phone)	Sami Daher, Dow Silicones Belgium SRL, Rue Jules Bordet, Parc Industriel- Zone C, 7180 Seneffe, Belgium, +32 64 88 80 00		
Product information			
Name of the product:	DOWSIL™ 813C Construction and Concrete Silicone Sealant	**Product type**	Sealant
Batch N°:	H041N8B052	**Article N°:**	
Model / Program / Series:		**Manufacture:** (Company, Address, Stamp)	Dow Silicones Belgium SRL, Rue Jules Bordet, Parc Industriel- Zone C, 7180 Seneffe, Belgium
Production & Sampling information			
Production Date: Time:	17/08/2023	**Sampling Date: Time:**	09/11/2023
Place of sampling (if deviating from the manufature)	Sami Daher, Dow Chemicals, 00971523999971	**Sample is taken from:**	☐ ongoing production ☐ stocks ☐ retained sample
		Number of samples:	3
Person in charge of sampling: (Name, company, telephone)		**Signature of sample collector:**	DAHER SAMI
Where has the product been stored prior to sampling?	☐ production ☑ store ☐ miscellaneous	**How has the product been stored prior to sampling?**	☐ open ☐ in the stack ☑ wrapped up
Place of storage:		*Packing material:*	
Specifics (possible negative influences by air contamination where sample was taken, by petrol emissions, by solvent emissions from production; any other uncertainties, questions, etc).		Not applicable	
Cut edges (identification of cut edges when present and identification of new surfaces and surface to be exposed in the emission test):		Not applicable	
Confirmation from the applicant			
Herewith the signer confirms the correctness of the data given above. The sample was selected, drawn and packed personally in accordance with the instructions for the taking of samples.			
Date:	**Signature:**		

	(Stamp)

Chain of custody

What is a Chain of custody?

Whenever the sample is handed over, please fill out the below information

Handed over between:	Initials + Signature	Date + Time	Condition
Handed over by			
Handed over to			
Handed over by			
Handed over to			
Handed over by			
Handed over to			

Laboratory receiving details (date, condition of package and sample, assigned lab no.): 10/11, Ok, 2300523301	
Receptionist, Eurofins Product Testing A/S: KW4T	Signature of receptionist: Anna Aastrup

7.3 How to Understand the Results

7.3.1 Acronyms Used in the Report

<	Means less than
>	Means bigger than
*	Not a part of our accreditation
¤	Please see section regarding uncertainty in the Appendices
§	Deviation from method. Please see deviation section
a	The method is not optimal for very volatile compounds. For these substances smaller results and a higher measurement uncertainty cannot be ruled out
b	The component originates from the substrate and is thus removed
c	The results have been corrected by the emission from the substrate
d	Very polar organic compounds are not suitable for reliable quantification using Tenax TA adsorbent and HP-5ms GC column. A high degree of uncertainty must be expected
e	The component may be overestimated due to contribution from the system
SER	Specific Emission Rate

7.3.2 Explanation of ID Category

Categories of Identity:

1: Identified by comparison with a mass spectrum obtained from library and supported by other information and quantified through specific calibration.

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

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

4: Not identified, quantified as toluene equivalent.

7.4 Description of VOC Emission Test

7.4.1 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 chamber operation parameters are as described in the test method section. (EN 16516, ISO 16000-9, internal method no.: 71M549811).
The recovery rates in the climate test chamber have been investigated using toluene and n-dodecane. The mean recovery rates of toluene and n-dodecane were concluded to be between 95 % and 100 % depending on the chamber size. These values comply with the criteria of a minimum mean recovery rate of 80 % stated in the 16000-9 test method.
Air sampling from the test chamber is carried out in a clean test chamber room at ambient air pressure and 23 ± 1 °C.

7.4.2 Expression of the Test Results

All test results are calculated as specific emission rate, and as extrapolated air concentration in the European Reference Room (EN 16516, AgBB, EMICODE, M1 and Indoor Air Comfort).

7.4.3 Testing of Carcinogenic VOCs

The emission of carcinogens (EU Categories C1A and C1B, as per European law) is tested by drawing sample air from the test chamber outlet through Tenax TA tubes after the specified duration of storage in the ventilated test chamber. Analysis is performed by ATD-GC/MS (automated thermal desorption coupled with gas chromatography and mass spectroscopy using 30 m HP-5 (slightly polar) column with 0.25 mm ID and 0.25 µm film, Agilent) (EN 16516, ISO 16000-6, internal methods no.: 71M549812 / 71M542808B).

All identified carcinogenic VOCs are listed; if a carcinogenic VOC is not listed then it has not been detected. Quantification is performed using the TIC signal and authentic response factors, or the relative response factors relative to toluene for the individual compounds.

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

7.4.4 Testing of VOC

The emissions of volatile organic compounds are tested by drawing sample air from the test chamber outlet through Tenax TA tubes after the specified duration of storage in the ventilated test chamber. Analysis is performed by ATD-GC/MS using HP-5 column (30 m, 0.25mm ID, 0.25µm film).
This test only covers substances which can be adsorbed on Tenax TA and can be thermally desorbed. If emissions of substances outside these specifications occur then these substances cannot be detected (or with limited reliability only).

7.4.5 Testing of Aldehydes

The presence of aldehydes is tested by drawing air samples from the test chamber outlet through DNPH-coated silicagel tubes after the specified duration of storage in the ventilated test chamber. Analysis is performed by solvent desorption and subsequently by HPLC and UV-/diode array detection.

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

Conversions of specific aldehydes from µg/m³ to ppm are done by the ideal gas law using a temperature of 23 degree Celsius and standard atmospheric pressure.

7.4.6 Testing of Charcoal tubes

The presence of low boiling VOC is tested by drawing air samples from the test chamber outlet through charcoal tubes after the specified duration of storage in the ventilated test chamber. Analysis is performed by solvent desorption and subsequently by HS-GC/MS using a stabilwax column. This test only covers substances which has a CREL value and are not possible to sample on Tenax tubes.

7.5 Quality Assurance

Before loading the test chamber, a blank check of the empty chamber is performed and compliance with background concentrations in accordance with EN 16516 / ISO 16000-9 is determined.

Air sampling at the chamber outlet and subsequent analysis is performed in duplicate. Relative humidity, temperature and air change rate in the chambers is logged every 5 minutes and checked daily. A double determination is performed on random samples at a regular interval and results are registered in a control chart to ensure the uncertainty and reproducibility of the method.

The stability of the analytical system is checked by a general function test of device and column, and by use of control charts for monitoring the response of individual substances prior to each analytical sequence.

7.6 Accreditation

The testing methods described above are accredited online with EN ISO/IEC 17025 by DANAK (no. 522). This accreditation is valid worldwide due to mutual approvals of the national accreditation bodies (ILAC/IAF, see also www.eurofins.com/galten.aspx#accreditation).

Not all parameters are covered by this accreditation. The accreditation does not cover parameters marked with an asterisk (*), however analysis of these parameters is conducted at the same level of quality as for the accredited parameters.

7.7 Uncertainty of the Test Method

The relative standard deviation of the overall analysis is 22%. The expanded uncertainty Um equals 2 x RSD. For further information please visit www.eurofins.dk/product-testing/uncertainty/.

7.8 Decision Rules

Eurofins Product Testing A/S, declare statement of conformity based on the “Binary Statement for Simple Acceptance Rule” described in ILAC’s “Guidelines on decision Rules and Statements of Conformity” ILAC-G8:09/2019.

This means that results above the detection limit are always reported with two significant digits. Results are evaluated with the same number of significant digits as the corresponding limit values, and conformity is based on results being less than or equal to limit values.

For limit values with more than two significant digits, the third digit will be used to confirm whether a result is below or equal to the limit value. It will always be indicated in the evaluation table if this expanded evaluation is performed.

For further information, please visit www.eurofins.dk/product-testing/om-os/beslutningsregler/

7.9 Version History

Report date	Report number	Modification
20/12/2023	392-2023-00523301_H_EN	Current version