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VOC EMISSION TEST REPORT

CDPH

2 September 2021

1 Sample Information

| | |
|------------------|-----------------|
| Sample name | V420+ V3 |
| Batch no. | 79005720 |
| Production date | 26/02/2020 |
| Product type | Chemical anchor |
| Sample reception | 16/03/2020 |

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



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3 Applied Test Methods

3.1 General Test References

| Regulation, protocol or standard | Version | Reporting limit VOC [$\mu\text{g}/\text{m}^3$] | Calculation of TVOC | Combined uncertainty ^a [RSD(%)] |
|----------------------------------|--|--|---------------------|--|
| EN 16516 | October 2017 | 5 | Toluene equivalents | 22% |
| ISO 16000 -3 -6 -9 -11 | 2006-2011 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 ^a [RSD(%)] |
|----------------------------|---|--------------|--|-------------------------|-----------------------------------|
| Sample preparation | ISO 16000-11:2006, EN16402:2013, CDPH:2017, AgBB:2018, EMICODE:2019 | 71M549810 | - | - | - |
| Emission chamber testing | ISO 16000-9:2006, EN 16516:2017 | 71M549811 | - | Chamber and air control | - |
| Sampling of VOC | ISO 16000-6:2011, EN 16516:2017 | 71M549812 | 5 L | Tenax TA | - |
| Analysis of VOC | ISO 16000-6:2011, EN 16516:2017 | 71M542808B | 1 $\mu\text{g}/\text{m}^3$ | ATD-GC/MS | 10% |
| Sampling of aldehydes | ISO 16000-3:2011, EN 16516:2017 | 71M549812 | 35 L | DNPH | - |
| Analysis of aldehydes | ISO 16000-3:2011, EN 717-1:2004, EN 16516:2017 | 71M548400 | 3-6 $\mu\text{g}/\text{m}^3$ | HPLC-UV | 10% |
| Sampling on Charcoal tubes | ISO 16200-1:2001 | 71M546081 | 60 L | charcoal | - |
| Analysis of Charcoal tubes | ISO-16200-1:2001 | 71M546081 | 20 $\mu\text{g}/\text{m}^3$ | Headspace-GC/MS | 10% |

The results are only valid for the tested sample(s).

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4 Test Parameters, Sample Preparation and Deviations

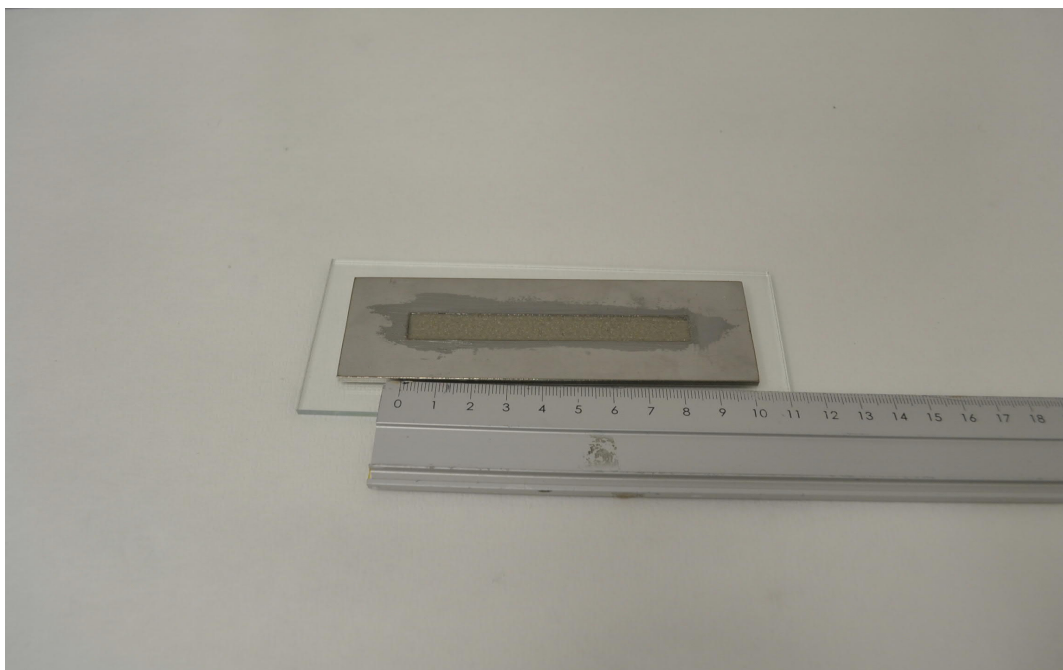
4.1 VOC Emission Chamber Test Parameters

| Parameter | Value | Parameter | Value |
|---|------------|--|-------------------------|
| Chamber volume, V[L] | 119 | Preconditioning period | - |
| Air Change rate, $n[h^{-1}]$ | 1.0 | Test period | 02/04/2020 - 16/04/2020 |
| Relative humidity of supply air, RH [%] | 50 ± 3 | Area specific ventilation rate, q [m/h or m ³ /m ² /h] | 143 |
| Temperature of supply air, T [°C] | 23 ± 1 | Loading factor [m ² /m ³] | 0.007 |
| | | Test scenario | Very small area |

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 “Chain of Custody” was not supplied by the client and is consequently not contained in the report.

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. | | | | 190 | 28000 |
| 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. | | | | 230 | 32000 |
| 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) | | | | | | | |
| Phenol * | 108-95-2 | 8.19 | 1 | 320 | 2.7 | 0.3 | 100 |
| 2-Ethyl-1-hexanol | 104-76-7 | 8.92 | 1 | 490 | 4.2 | 0.5 | |
| 2-Phenoxy ethanol * | 122-99-6 | 11.36 | 1 | 500 | 4.3 | 0.5 | |
| Not identified * | | 11.61 | 4 | 590 | 5.0 | 0.6 | |
| 1,4-Butylene glycol dimethacrylate * | 2082-81-7 | 14.46 | 2 | 56000 | 480 | 58 | |
| TVOC (C5-C17)tol. eq. | | | | 57000 | 490 | 59 | |
| Aldehydes | | | | | | | |
| Formaldehyde | 50-00-0 | | 1 | < 500 | < 5 | < 1 | 9 |
| Acetaldehyde | 75-07-0 | | 1 | < 500 | < 5 | < 1 | 70 |

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6 Summary and Evaluation of the Results

6.1 Comparison with Limit Values of CDPH

| Parameter | Test after 14 days | | | |
|---|---------------------------------|--|--|------------------------------------|
| | CAS No. Single compounds | Concentration in Classroom [µg/m ³] | Concentration in Office Room [µg/m ³] | ½ CREL [µg/m ³] |
| TVOC (C5-C17)tol. eq. | - | 490 | 59 | - |
| Single compounds (with defined CREL values) | | | | |
| Phenol * | 108-95-2 | 2.7 | 0.3 | 100 |
| Formaldehyde | 50-00-0 | < 5 | < 1 | ≤ 9 |
| Acetaldehyde | 75-07-0 | < 5 | < 1 | ≤ 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.

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

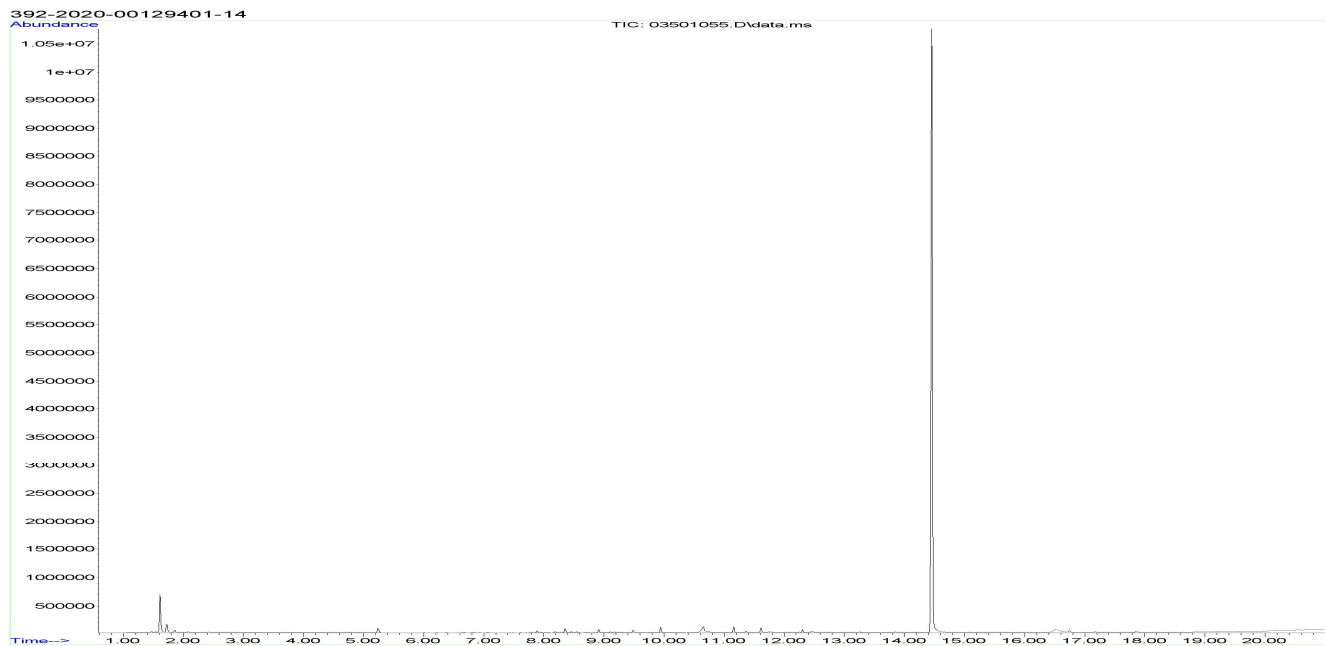
| | | Classroom parameters | Office Room parameters |
|-----|--|----------------------|------------------------|
| SER | Area specific emission rate, µg/(m ² h) | As tested | As tested |
| n | Air change, h ⁻¹ | 0.82 | 0.68 |
| V | Volume of reference room, m ³ | 231 | 30.6 |
| A | Floor area, m ² | 89.2 | 11.1 |
| | Walls area, m ² | 94.3 | 33.4 |
| | Ceiling and Wall, m ² | 183.8 | N/A |
| | Door and Millwork, m ² | 1.89 | 1.89 |
| | Desk or Chair, units | 27 | 1 |
| | Very Small areas, m ² | 1.62 | 0.021 |
| | Small areas, m ² | 11.55 | 1.53 |

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7 Appendices

7.1 Chromatogram of VOC Emissions after 14 Days



7.2 How to Understand the Results

7.2.1 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-5 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. |

7.2.2 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.

7.3 Description of VOC Emission Test

7.3.1 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).

7.3.2 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).

7.3.3 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 μ m 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).

7.3.4 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, 0.25 μ m 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).

7.3.5 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.

7.3.6 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.

7.4 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.

7.5 Accreditation

The testing methods described above are accredited on line 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.

7.6 Uncertainty of the Test Method

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

7.7 Version History

| Report date | Report number | Modification |
|-------------|---------------------------|------------------|
| 02/09/2021 | 392-2020-00129401_H_EN_07 | Current version. |