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VOC TEST REPORT CDPH

04 February 2016

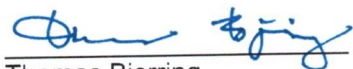
1 Sample Information

Sample name	ECOS Eggshell Light
Batch no.	FF33415EGWB
Production date	December 1 st 2015
Product type	Coating
Sample reception	14/12/2015

2 Brief Evaluation of the Results

Regulation or protocol	Conclusion	Version of regulation or protocol
CDPH	Pass	CDPH/EHLB/Standard Method V1.1. (February 2010)

Full details based on the testing and direct comparison with limit values is available in the following pages



Thomas Bjerring
Analytical Service Manager

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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(%)]
CEN/TS 16516	October 2013	5	Toluene equivalents	22.5%
ISO 16000 -3 -6 -9 -11	2006-2011 depending on part	2	Toluene equivalents	22.5%
CDPH	CDPH/EHLB/Standard Method V1.1. (February 2010)	2	Toluene equivalents	22.5%

3.2 Specific Laboratory Sampling and Analyses

Procedure	External Method	Internal S.O.P.	Quantification limit	Analytical principle	Uncertainty ^a [RSD(%)]
Sample preparation	ISO 16000-11:2006, EN16402:2013, CDPH, AgBB/DIBt, EMICODE	71M549810	-	-	-
VOC emission chamber testing	ISO 16000-9:2006, CEN/TS 16516:2013	71M549811	-	Chamber and air control	-
Sampling of VOC	ISO 16000-6:2011, CEN/TS 16516:2013	71M549812	5 L	Tenax TA	-
Analysis of VOC	ISO 16000-6:2011, CEN/TS 16516:2013	71M542808B	1 $\mu\text{g}/\text{m}^3$	ATD-GC/MS	10%
Sampling of aldehydes	ISO 16000-3:2011, CEN/TS 16516:2013	71M549812	35 L	DNPH	-
Analysis of aldehydes	ISO 16000-3:2011, EN 717-1, CEN/TS 16516:2013	71M548400	3-6 $\mu\text{g}/\text{m}^3$	HPLC-UV	10%

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4 Test Parameters, Sample Preparation and Deviations

4.1 VOC Emission Chamber Test Parameters

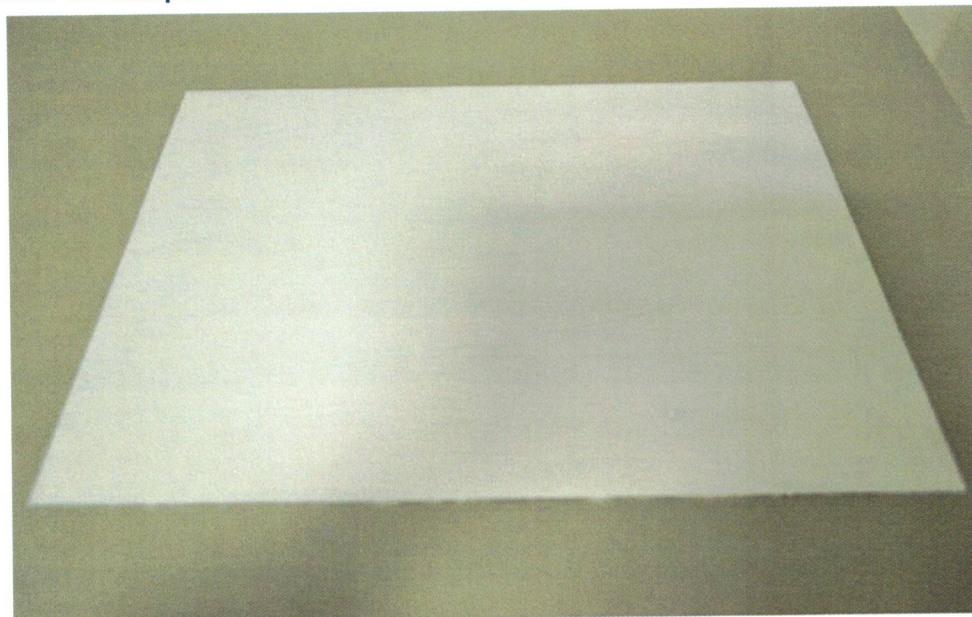
Parameter	Value	Parameter	Value
Chamber volume, V[L]	119	Preconditioning period	-
Air Change rate, n[h ⁻¹]	0.5	Test period	12/01/2016 - 26/01/2016
Relative humidity of supply air, RH [%]	50 ± 3	Area specific ventilation rate, q [m/h or m ³ /m ² /h]	0.5
Temperature of supply air, T [°C]	23 ± 1	Loading factor [m ² /m ³]	1.0

4.2 Preparation of the Test Specimen

The sample was homogenised and applied onto a glass plate.

Number of Layers	Application amount, g/m ²	Drying time, h
2	99	6

4.3 Picture of Sample



4.4 Deviations from Referenced Protocols and Regulations

The air change rate was 0.5/h (not 1.0/h) during testing; the results were calculated back to normative air exchange rates for class room and small office.

5 Results

5.1 VOC Emission Test Results after 11 Days

	CAS No.	Specific Conc. [µg/m ³]	Specific SER [µg/(m ² *h)]	Toluene eq. [µg/m ³]	Toluene SER [µg/(m ² *h)]
TVOC (C5-C17)		-	-	96	48
Aldehydes					
Formaldehyde	50-00-0	< 3	< 2	-	-
Acetaldehyde	75-07-0	< 3	< 2	-	-

5.2 VOC Emission Test Results after 12 Days

	CAS No.	Specific Conc. [µg/m ³]	Specific SER [µg/(m ² *h)]	Toluene eq. [µg/m ³]	Toluene SER [µg/(m ² *h)]
TVOC (C5-C17)		-	-	70	35
Aldehydes					
Formaldehyde	50-00-0	< 3	< 2	-	-
Acetaldehyde	75-07-0	< 3	< 2	-	-

5.3 VOC Emission Test Results after 14 Days

	CAS No.	Retention time [min]	ID-Cat	SER [µg/(m ² *h)]	Classroom Conc. [µg/m ³]	Office Conc. [µg/m ³]	½ CREL [µg/m ³]
VOC (C5-C17)							
2-Ethyl-1-hexanol	104-76-7	8.75	1	2.6	1.3	4.2	-
2-Ethylhexyl acetate	103-09-3	10.34	1	2.8	1.4	4.5	-
2-methyl-4-isothiazolin-3-on *	2682-20-4	10.65	1	5.9	2.9	9.5	-
2-Ethylhexyl acrylate	103-11-7	11.26	1	13	6.5	21	-
Not identified *	-	11.36	4	1.2	0.6	1.9	-
2,4,7,9-Tetramethyl-5-decin-4,7-diol *	126-86-3	13.15	2	12	6.0	19	-
TVOC (C5-C17)				30	15	48	
Aldehydes							
Formaldehyde	50-00-0		1	< 2	< 2	< 4	9
Acetaldehyde	75-07-0		1	< 2	< 2	< 4	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)	-	15	48	-
Single compounds (with CREL values)				
None determined	-	-	-	-
Formaldehyde	50-00-0	< 2	< 4	≤ 9
Acetaldehyde	75-07-0	< 2	< 4	≤ 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 CEN/TS 16516 and ISO 16000-9.

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

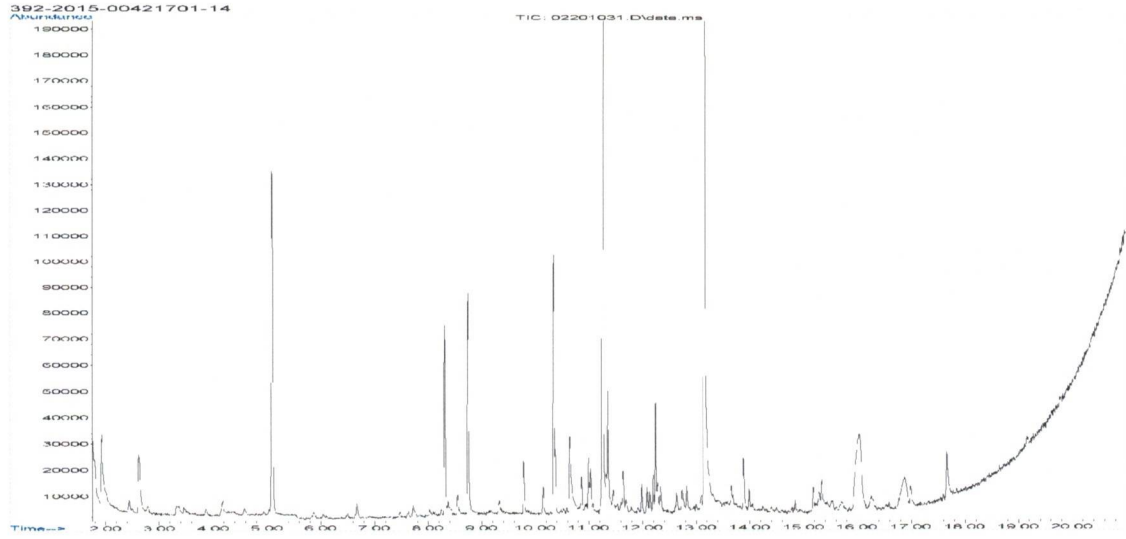
		Classroom parameters	Office Room parameters
SER	Area specific emission rate, µg/(m ² h)	As tested	As tested
n	Air change, h ⁻¹	0.82	0.68
V	Volume of reference room, m ³	231	30.6
	Floor area, m ²	89.2	11.1
A	Walls area, m ²	94.3	33.4
	Ceiling and Wall, m ²	183.8	N/A
	Door and Millwork, m ²	1.89	1.89
	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


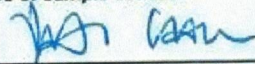
7.1 Chromatogram of VOC Emissions after 14 Days



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7.2 Chain of Custody

Name of the product: ECOS Eggshell Light		Type of product: Wall Paint	
Model / Program / Series:		Batch N°.: FF33415EGWB	
Article N°.: Misc.		Date of batch production: December 1 st 2015	
Name of the manufacturer at the place of sampling (address / stamp): Imperial Paints LLC, 2994 Fairforest Clevedale Road, Spartanburg, South Carolina 29301, USA		Manufacturer (if deviating from company's name at the place of sampling):	
Sample collector (Name, company, telephone): Mickey Thompson, Imperial Paints LLC, 001 864 595 3840		Signature of sample collector: 	
Sample is taken from <input type="checkbox"/> the ongoing production - YES <input type="checkbox"/> stocks		Date of sampling: Dec 10 2015	
Number of Samples One		Time: 11:40am	
Where had the product been stored prior to sampling? <input type="checkbox"/> Production - YES <input type="checkbox"/> Store <input type="checkbox"/> Miscellaneous	How had the product been stored prior to sampling? <input type="checkbox"/> open <input type="checkbox"/> in the stack - YES <input type="checkbox"/> wrapped up	Packing material: Recycled Polypropylene Can	
Place of storage: Production Area			
Further links in chain of custody (Name, function, company, telephone)		Signature	
Further links in chain of custody (Name, function, company, telephone)		Signature	
Sample sender (Name, company, telephone): Julian Crawford, Imperial Paints LLC, 001 864 595 3840		Signature of sample sender: 	
Date and time of sending: DEC 10 2015 4:00PM		Shipment details/Carrier: UPS	
Where had the product sample been stored prior to sending? <input type="checkbox"/> Production - YES <input type="checkbox"/> Store <input type="checkbox"/> Miscellaneous	How had the product sample been stored prior to sending? <input type="checkbox"/> open <input type="checkbox"/> in the stack - YES <input type="checkbox"/> wrapped up	Packing material: Recycled Polypropylene Can	
Place of storage: Production Area			
Laboratory receiving details (date, condition of package and sample, assigned lab no.):			
Receptionist, Eurofins Product Testing A/S:		Signature of receptionist:	

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7.3 How to Understand the Results

7.3.1 Acronyms Used in the Report

- < Means less than
- > Means bigger than (Tube/GC-MS overload)
- * Not a part of our accreditation
- ▣ Um(%) is given as 2x RSD%. 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 wooden panels and is thus removed.
- c The results have been corrected by the emission from wooden panels.
- 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.

SER Specific emission rate.

7.3.2 Explanation of ID Category

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.

7.4 Qualitative 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. (CEN/TS 16516, ISO 16000-9, internal method no.: 71M549811).

7.4.2 Expression of the Test Results

All test results are calculated as specific emissions rate, and as extrapolated air concentration in the European Reference Room (CEN/TS 16516, AgBB, EMI CODE, 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) (CEN/TS 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) (CEN/TS 16516, ISO 16000-6, internal methods no.: 71M549812 / 71M542808B).

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 after the specified duration of storage in the ventilated test chamber 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 (CEN/TS 16516, ISO 16000-3, VDI 3862 Blatt 3, internal methods no.: 71M549812 / 71M548400).

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.

7.5 Quality Assurance

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

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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 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.

7.7 Uncertainty of the Test Method

The relative standard deviation of the overall analysis is 22.5%. The expanded uncertainty U_m equals 2 x RSD. For further information please visit www.eurofins.dk/uncertainty.