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Spain

Test Report No. 50457-001 (III)

VOC decree Belgium

Client:	IEdiSA, SA
Sample description by client:	Graphenstone Pintura Interior
Sampling by:	Client
Date of arrival of sample:	15.07.2015
Date of report:	09.09.2015
Number of pages of report:	13
Testing parameter:	see table of contents
Testing laboratory:	eco-INSTITUT Germany GmbH, Cologne

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Sample view

Internal Sample-no.	Description by customer	Condition upon delivery	Type of sample
A001	Graphenstone Pintura Interior	without objection	material sample

Test Report

1 Emission test

1.1 Volatile Organic Compounds (VOC)

Definition of terms:

VOC (volatile organic compounds)	All individual materials with a concentration $\geq 0,001 \text{ mg/m}^3$ in retention range C_6 (n-Hexane) to C_{16} (n-Hexadecane) Substances refer to LCI lists / AgBB (DIBt)
TVOC (Total volatile organic compounds)	Sum of all individual substances in retention range C_6 to C_{16} .
CMR-VOC (carcinogenic, mutagenic, reproduction-toxic VOC, VVOC and SVOC)	All individual substances with the following categories: Regulation (EC) No. 1272/2008: Category Car.1A and 1B, Muta. 1A and 1B, Repr. 1A and 1B TRGS 905: K1 and K2, M1 and M2, R1 and R2 IARC: Group 1 and 2A DFG (MAK lists): Category III1 and III2
VVOC (very volatile organic compounds)	All individual substances with concentration $\geq 0,001 \text{ mg/m}^3$ in retention range $< C_6$
TVVOC (Total very volatile organic compounds)	Sum of all VVOC in retention range $< C_6$
SVOC (semi volatile organic compounds)	All individual materials $\geq 0,001 \text{ mg/m}^3$ in retention range $> C_{16}$ (n-Hexadecane) to C_{22} (Docosane)
TSVOC (Total semi volatile organic compounds)	Sum of all SVOC in retention range $> C_{16}$ to C_{22} .
Identified and calibrated substances ($C_{id \text{ sub}}$), substance specific calculated	Spectrum and retention time are concordant with the calibrated comparison substance
Not identified substances calculated as toluene equivalent ($C_{ni \text{ tol}}$)	Suggestion from the spectrum library with high probability and/or allocation to a group of substances
SER	Specific emission rate (see appendix)
LCI value	Lowest Concentration of Interest; calculated value for the evaluation of VOC, established by the Committee for Health-related Evaluation of Building Products (Ausschuss zur gesundheitlichen Bewertung von Bauprodukten - AgBB)
R value	The quotient of the concentration and the LCI value is generated for every substance which is detected in the test chamber air. The sum of the calculated quotients results in the R value.

List of analysed VOCs:

Aromatic hydrocarbons

Toluene
Ethylbenzene
p-Xylene
m-Xylene
o-Xylene
Isopropylbenzene
n-Propylbenzene
1,3,5-Trimethylbenzene
1,2,4-Trimethylbenzene
1,2,3-Trimethylbenzene
2-Ethyltoluene
1-Isopropyl-4-methylbenzene
1,2,4,5-Tetramethylbenzene
n-Butylbenzene
1,3-Diisopropylbenzene
1,4-Diisopropylbenzene
Phenyl octane
1-Phenyl decane²
1-Phenyl undecane²
4-Phenylcyclohexene
Styrene
Phenyl acetylene
2-Phenyl propene
Vinyl toluene
Naphthalene
Indene
Benzene
Cresol

Saturated aliphatic substances

Hydrocarbons
2-Methyl pentane¹
3-Methyl pentane¹
n-Hexane
Cyclohexane
Methylcyclohexane
n-Heptane
n-Octane
n-Nonane
n-Decane
n-Undecane
n-Dodecane
n-Tridecane
n-Tetradecane
n-Pentadecane
n-Hexadecane
Methylcyclopentane
1,4-Dimethylcyclohexane

Terpenes

δ-3-Caren
α-Pinene
β-Pinene
Limonene
Longifolene
Caryophyllene
Isolongifolene
alpha-Phellandrene
Myrcene
Camphene
alpha-Terpinend
Longipinene
beta-Caryophyllene
beta-Farnesen
alpha-Bisabolon

Aliphatic alcohols and ether

1-Propanol¹
2-Propanol¹
tert-Butanol
2-Methyl-1-propanol

1-Butanol
1-Pentanol
1-Hexanol
Cyclohexanol
2-Ethyl-1-hexanol
1-Octanol
4-Hydroxy-4-methyl-pentan-2-one
1-Heptanol
1-Nonanol
1-Decanol

Aromatic alcohols (phenols)

Phenol
BHT (2,6-di-tert-butyl-4-methylphenol)
Benzylalcohol

Glycols, Glycol ether, Glycol ester

Propylenglycol (1,2-Dihydroxypropane)
Ethylene glycol (Ethandiol)
Ethylene glycol monobutyl ether
Diethylene glycol
Diethylene glycol-monobutyl ether
2-Phenoxyethanol
Ethylene carbonate
1-Methoxy-2-propanol
Glycolic acid butyl ester
Texanol
Butyldiglycol acetate
Dipropylenglycol mono-methyl ether
2-Methoxyethanol
2-Ethoxyethanol
2-Propoxyethanol
2-Methylethoxyethanol
2-Hexoxyethanol
1,2-Dimethoxyethane
1,2-Diethoxyethane
2-Methoxyethyl acetate
2-Ethoxyethyl acetate
2-Butoxyethyl acetate
2-(2-Hexoxyethoxy)-ethanol
1-Methoxy-2-(2-methoxy-ethoxy)-ethane
Propylene glycol di-acetate
Dipropylene glycol
Dipropylene glycol monomethylether acetate
Dipropylene glycol mono-n-propylether
1,4-Butanediol
Tripropyleneglycolmonomethyl ether
Triethylene glycol dimethyl ether
1,2-Propylene glycol dimethyl ether
TXIB
Ethylidiglycol
Dipropylene glycol-dimethyl ether
Propylene carbonate
Hexylene glycol
3-Methyl-1-butanol
1,2-Propylene glycol n-propyl ether
1,2-Propylene glycol n-butyl ether
Diethylglycol phenyl ether
Neopentyl glycol

Aldehydes

Butanal^{1,3}
Pentanal³
Hexanal
Heptanal
2-Ethylhexanal
Octanal
Nonanal
Decanal
2-Butenal³

2-Pentenal³
2-Hexenal
2-Heptenal
2-Octenal
2-Nonenal
2-Decenal
2-Undecenal
Furfural
Glutaraldehyde
Benzaldehyde
Acetaldehyde^{1,3}
Propanal^{1,3}
Propenal^{1,3}
Isobutanol
3-Methyl-2-propanol
Methylisobutylketone
Cyclopentanone
Cyclohexanone

Ketones

Ethylmethylketone³
3-Methyl-2-propanol
Methylisobutylketone
Cyclopentanone
Cyclohexanone
Acetone^{1,3}
2-Methylcyclopentanone
2-Methylcyclohexanone
Acetophenone
1-Hydroxyacetone

Acids

Acetic acid
Propionic acid
Isobutyric acid
Butyric acid
Pivalic acid
n-Valeric acid
n-Hexanoic acid
n-Heptanoic acid
n-Octanoic acid
2-Ethylhexanoic acid

Esters and Lactones

Methylacetate¹
Ethyl acetate¹
Vinyl acetate¹
Isopropyl acetate
Propyl acetate
2-Methoxy-1-methylethyl acetate
n-Butyl formate
Methylmethacrylate
Isobutylacetate
1-Butyl acetate
2-Ethylhexyl acetate
Methyl acrylate
Ethyl acrylate
n-Butyl acrylate
2-Ethylhexyl acrylate
Adipic acid dimethyl ester
Fumaric acid dibutyl ester
Succinic acid dimethyl ester
Hexandioldiacrylate
Maleic acid dibutyl ester
Butyrolactone
Dibutyl glutarate
Dibutyl succinate
Dimethylphthalate
Texanol
Dipropylene glycol diacrylate

Chlorinated hydrocarbons

Tetrachlorethene
1,1,1-Trichlorethane
Trichlorethene
1,4-Dichlorbenzene

Others

1,4-Dioxane
Caprolactam
N-Methyl-2-pyrrolidone
Octamethylcyclotetrasiloxane
Methanamine
2-Butanonoxime
Triethyl phosphate
5-Chlor-2-methyl-4-isothiazolin-3-one
2-Methyl-4-isothiazolin-3-one (MIT)
Triethylamine
Decamethylcyclopentasiloxane
Dodecamethylcyclopentasiloxane
Tetrahydrofuran (THF)
1-Decene
1-Octene
2-Pentylfuran
Tetramethyl succinonitrile
Propylencarbonate
Isophorone
Dimethylformamide (DMF)
Tributyl phosphate

1 VVOC

2 SVOC

3 Analysis according to
DIN ISO 16000-3

Explanation of the Specific Emission Rate SER

Emission measurements are accomplished in test chambers under defined physical conditions (temperature, relative humidity, room loading, air change rate etc.).

Test chamber measurement results are directly comparable only if the investigations were accomplished under the same basic conditions.

If the differences of the physical conditions refer only to the change of air rate and/or the loading, the "SER" or "specific emission rate" can be used for comparability of the measurement results. The SER indicates how many volatile organic compounds (VOC) are released by the sample for each material unit and hour (h). The SER can be calculated using the formula below for each proven individual component of the VOC from the data in the test report.

As material units the following are applicable:

l = unit of length (m)	relation between emission and length
a = unit area (m ²)	relation between emission and surface
v = unit volume (m ³)	relation between emission and volume
u = piece unit (unit = piece)	relation between emission and complete unit

From this the different dimensions for SER result:

length-specific	SER _l in µg/m h
surface-specific	SER _a in µg/m ² h
volume-specific	SER _v in µg/m ³ h
unit specific	SER _u in µg/u h

SER thus represents a product specific rate, which describes the mass of the volatile organic compound, which is emitted by the product per time unit at a certain time after beginning of the examination.

$$\boxed{\text{SER} = q \cdot C}$$

q	specific air flow rate (quotient from change of air rate and loading)
C	Concentration of the measured substance(s)

The result can be indicated in milligrams (mg) in place of micro grams (µg), whereby 1 mg = 1000 µg.

Test method TS 16516 with following parameters:

Preparation of test sample:	Date:	06.08.2015
	Pre-treatment:	not applicable
	Masking of backside:	not applicable
	Masking of edges:	not applicable
	Relationship of unmasked edges to surface:	not applicable
	Charging:	related to area
	Dimensions:	2 x (25 cm x 25 cm) (10,4 g / application / plate)
Test chamber conditions:	Chamber volume:	0.125 m ³
	Temperature:	23 °C
	Relative humidity:	50 %
	Air pressure:	normal
	Air:	cleaned
	Air change rate:	0.5 h ⁻¹
	Air velocity:	0.3 m/s
	Loading:	1 m ² /m ³
	Specific air flow rate:	0.5 m ³ /m ² · h
	Air sampling:	3 and 28 days after test chamber loading
Analytics:	DIN ISO 16000-3	
	Limit of determination:	2 µg/m ³
	DIN ISO 16000-6	
	Limit of determination:	1 µg/m ³

Measurement time 28 days after test chamber loading

1.1.1 CMR-VOC_{28d}

Test parameter:

Carcinogenic, mutagenic and reproduction-toxic volatile organic compounds (CMR VOC), test chamber, air sampling 28 days after test chamber loading

Test result:

Sample: A001: Graphenstone Pintura Interior

No.	Substance	CAS No.	Concentration (Test chamber air) [µg/m ³]	CMR classification*)
VOC_{28d}: Identified and calibrated substances in accordance with LCI list/AgBB, substance specific calculated (C_{id sub})				
-	-	-	n.d.	-

VOC_{28d}: Further identified and calibrated CMR substances in addition to LCI list/AgBB, substance specific calculated(C_{id sub})				
-	-	-	n.d.	-

VOC_{28d}: Further identified, not calibrated CMR substances, calculated as toluene equivalent (C_{ni tol})				
-	-	-	n.d.	-

*) Classification acc. to Regulation (EC) No. 1272/2008: Category Carc. 1A and 1B, Muta. 1A and 1B, Repr. 1A and 1B, TRGS 905: K1 and K2, M1 and M2, R1 and R2, IARC: Group 1 and 2A, DFG (MAK list): Category III1 and III2

	Concentration (Test chamber air) [µg/m ³]	SER _a [µg/m ² h]
Sum of VOC with the following categorisations: Regulation (EC) No. 1272/2008: Category Carc. 1A and 1B, Muta. 1A and 1B, Repr. 1A and 1B TRGS 905: K1 and K2, M1 and M2, R1 and R2 IARC: Group 1 and 2A DFG (MAK list): Category III1 and III2	n.d.	n.d.

n.d. = not detectable

1.1.2 VOC / TVOC_{28d}

Test parameter:

Volatile organic compounds (VOC), test chamber, air sampling 28 days after test chamber loading

Test result:

Sample: | A001: Graphenstone Pintura Interior

No.	Substance	CAS No.	Concentration (Test chamber air) [µg/m ³]
VOC_{28d}: Identified and calibrated substances in accordance with LCI list/AgBB, substance specific calculated (c_{id sub})			
6	Glycols, Glycol ethers, Glycol esters		
6-31	Dipropylene glycol mono-n-butyl ether	29911-28-2	1
7	Aldehydes		
7-19	Benzaldehyde	100-52-7	4
10	Esters and Lactones		
10-25	Dibutyl glutarate	71195-64-7	1

VOC_{28d}: Further identified and calibrated substances in addition with LCI list/AgBB, substance specific calculated (c_{id sub})			
12	Others		
	Hexamethylcyclotrisiloxane	541-05-9	4

VOC_{28d}: Not calibrated substances calculated as toluene equivalent (c_{ni tol})			
	-	-	n.d.

Total volatile organic compounds	Concentration (test chamber air) [µg/m ³]	SER _a [µg/m ² h]
TVOC _{28d}	10	5
TVOC _{28d, tol, substances ≥ 5 µg/m³, according to TS 16516}	n.d.	n.d.

Further VOC sums	Concentration (test chamber air) [µg/m ³]	SER _a [µg/m ² h]
Sum VOC without LCI	4	2
Sum of bicyclic Terpenes	n.d.	n.d.
Sum of sensitising materials with the following categorisations: DFG (MAK lists): Category IV German Federal Institute for Risk Assessment lists: Cat A TRGS 907	n.d.	n.d.
Sum of VOC with the following categorisations: Regulation (EC) No. 1272/2008: Category Carc. 2, Muta. 2, Repr. 2 TRGS 905: K3, M3, R3 IARC: Group 2B DFG (MAK list): Category III3	n.d.	n.d.
C ₉ - C ₁₄ - Alkanes / Isoalkanes	n.d.	n.d.
Sum C ₄ -C ₁₁ Aldehydes, acyclic, aliphatic	n.d.	n.d.
Sum C ₉ -C ₁₅ Alkyl benzenes	n.d.	n.d.
Sum Cresols	n.d.	n.d.

R-Value (without dimension) _{28d}	0,06
R-Value (without dimension) _{28d} Belgian VOC regulation	0

n.d. = not detectable

1.1.3 SVOC_{28d}

Test parameter:

Semivolatile organic compounds (SVOC), test chamber, air sampling 28 days after test chamber loading

Test result:

Sample: | A001: Graphenstone Pintura Interior

No.	Substance	CAS No.	Concentration (test chamber air) [µg/m ³]
SVOC_{28d}: Identified and calibrated substances in accordance with LCI list/AgBB, substance specific calculated(C_{id sub})			
-	-	-	n.d.

SVOC_{28d}: Further identified and calibrated substances in addition to LCI list/AgBB, substance specific calculated(C_{id sub})			
-	-	-	n.d.

SVOC_{28d}: Not calibrated substances calculated as toluene equivalent (c_{ni tol})			
-	-	-	n.d.

Total semivolatile organic compounds	Concentration (test chamber air) [µg/m ³]	SER _a [µg/m ² h]
TSVOC_{28d}	n.d.	n.d.
TSVOC_{28d}, substances ≥ 5 µg/m³	n.d.	n.d.

n.d. = not detectable

1.1.4 **VVOC_{28d}**

Test Parameter:

Very volatile organic compounds (VVOC), test chamber, air sampling 28 days after test chamber loading

Test result:

Sample: | A001: Graphenstone Pintura Interior

No.	Substance	CAS-No.	Concentration (test chamber air) [µg/m³]
VVOC_{28d}: Identified and calibrated substances in accordance with LCI list/AgBB, substance specific calculated (C_{id sub})			
-	-	-	n.d.

VVOC_{28d}: Further identified and calibrated substances in addition to LCI list/AgBB, substance specific calculated (C_{id sub})			
-	-	-	n.d.

VVOC_{28d}: Not calibrated, identified substances calculated as toluene equivalent (C_{ni tol})			
-	-	-	n.d.

Total very volatile organic compounds	Concentration (test chamber air) [µg/m³]	SER _a [µg/m²h]
TVVOC_{28d}	n.d.	n.d.

n.d. = not detectable

1.1.4.1 Formaldehyde_{28d} and Acetaldehyde_{28d}

Test parameter:

Formaldehyde and Acetaldehyde, test chamber, air sampling 28 days after test chamber loading

Test method:

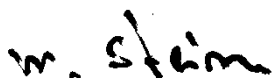
Preparation of test sample and Test chamber conditions:	see Volatile organic compounds
Analytics:	DIN ISO 16000-3
Limit of determination:	2 µg/m ³ ≈ 0,002 ppm

Test result:

Sample:	A001: Graphenstone Pintura Interior
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Substance	Concentration (Test chamber air) [µg/m ³]	Concentration (Test chamber air) [ppm]
Formaldehyde	< 2	< 0,002
Acetaldehyde	< 2	-

Cologne, 09.09.2015



Michael Stein, Dipl.-Chem.
(Deputy Technical Manager)

2 Expert evaluation (Belgian VOC regulation)

The product **Graphenstone Pintura Interior** has been tested on behalf of **IEdiSA SA**.

This evaluation bases on the test criteria of the “**Royal Decree establishing threshold levels for the emissions to the indoor environment from floor coverings, flooring adhesives and surface coatings for wood floorings**” submitted for EU notification by Belgian ministries on the 18th of August 2014.

The results documented in the test report were evaluated as follows.

Test parameter	Result	Requirement	Requirement hold [yes/no]
Emission analysis			
Measurement time: 28 days after test chamber loading			
Total concentration of volatile organic compounds (TVOC _{tol}) ¹⁾	< 1 µg/m ³	≤ 1000 µg/m ³	yes
Total concentration of semi volatile organic compounds (TSVOC) ¹⁾	< 1 µg/m ³	≤ 100 µg/m ³	yes
Carcinogenic, reproduction toxic and mutagenic compounds, cat. 1A and 1B acc. to Regulation (EC) No. 1272/2008	< 1 µg/m ³	≤ 1 µg/m ³	yes
R value (without dimension)	0	≤ 1	yes
Toluene	< 1 µg/m ³	≤ 300 µg/m ³	yes
Formaldehyde	< 2 µg/m ³	≤ 100 µg/m ³	yes
Acetaldehyde	< 2 µg/m ³	≤ 200 µg/m ³	yes

1) for TVOC and TSVOC only substances ≥ 5 µg/m³ are considered

2.1 Summary evaluation

The product **Graphenstone Pintura Interior** meets the requirements of the “**Royal Decree establishing threshold levels for the emissions to the indoor environment from floor coverings, flooring adhesives and surface coatings for wood floorings**”.

Cologne, 09.09.2015



Tobias Rüsing, Dipl.-Geol.
(Project Manager)