REPORT

issued by an Accredited Testing Laboratory

Contact person RISE
Thomas Vaessen
Chemistry and Materials
+46 10 516 51 79
thomas.vaessen@ri.se

Date	Reference	Page
2018-04-09	8P02203-02	1 (5)

Testing

IM Sweden EX AB
Dennis Vilhelmsson
Bilgatan 23
44240 Kungälv

Emission measurements after 28 days

(2 appendices)

Object

One sample of acoustic underlay for a floor was delivered to RISE by the customer.

Product name:	**Timbertech TT**
Production date:	2018 week 2
Batch:	1802TT
Size of sample:	0.5 x 0.5 m
Date of sampling:	2018-02-15
Date of arrival to RISE:	2018-02-16
Date of analysis:	week 8 till 12

Assignment

Emission measurement according to ISO 16000-9:2006 (Indoor air – Part 9: Determination of the emission of volatile organic compounds from building products and furnishing – Emission test chamber method), after 28 days regarding volatile organic compounds (VOC and VVOC/SVOC), carcinogenic substances (VOC-substances, EU Regulation No 1272/2008 Annex VI, cat 1A and 1B), formaldehyde and acetaldehyde (ISO 16000-3:2011). Evaluation according to EN 16516:2017 (EU-LCI values).

Method

The test was started 2018-02-19 by unwrapping test sample. The sample was placed onto a glass plate and short edges and part of the front were sealed with aluminium tape.
Open surface area was 0.18 m^2. The specimen was placed in a room with controlled climate conditions of 23 ± 2 ^oC and 50 ± 5 % RH. The test specimen was put into the chamber three days prior to air samplings. Air samplings after 28 days of conditioning were carried out on 2018-03-19.

Test conditions in the chamber:

Chamber volume:	0.25 m^3
Temperature:	23 ± 0.5 ^oC
Relative humidity:	50 ± 5 % RH
Surface area of test specimen:	0.18 m^2
Air exchange rate:	0.5 h^{-1}
Area specific air flow rate:	0.7 m^3/m^2 h
Air velocity at specimen surface:	0.1 – 0.3 m/s

SWEDAC ACKREDITERING
Accred. No. 1002
Testing
ISO/IEC 17025

Tenax TA was used as adsorption medium for VOC. The tubes were thermally desorbed and analysed in accordance to RISE method 0601, similar to ISO 16000-6:2011 (Determination of volatile organic compounds in indoor and test chamber air by active sampling on Tenax TA sorbent, thermal desorption and gas chromatography using MS/FID). This means an analysis in a gas chromatograph and detection with a flame ionisation detector (FID) and mass selective detector (MS). The capillary column used is coated with 5% phenyl/ 95 % methylpolysiloxane. The FID signals are used for compound quantification. The total volatile organic compounds (TVOC) means compounds eluting between and including n-hexane to hexadecane, having boiling points in the range of about 70-260 °C. Minimum duplicate air samples were taken and the results are mean values. Sampled volumes are 3 to 8 L.

Tenax TA was also used as adsorption medium for testing of volatile carcinogenic compounds according to EU Regulation No 1272/2008 Annex VI, cat 1A and 1B), (exclusive formaldehyde), 1 µg/m^3 and above.

The samplings of aldehydes were carried out with DNPH samplers. The samplers were analysed according to RISE method 2302, similar to ISO 16000-3:2011(Indoor air - Part 3: Determination of formaldehyde and other carbonyl compounds – Active sampling method). This means analysis on a liquid chromatograph with absorbance detector. Duplicate air samples were taken and the results are mean values. Sampled volumes were 30 to 50 L.

Results

The results in Table 1 are expressed as area specific emission rates and as concentrations in a reference room (according to EN 16516:2017). The reference room has a base area of 3 m x 4 m and a height of 2.5 m, with an air exchange rate of 0.5 h^{-1}. The wall area is 31.4 m^2, floor area is 12 m^2, small area, like a door, is 1.6 m^2 and very small area, like sealant, is 0.2 m^2. Floor area is used for the calculation of the concentrations.

Calculation of the concentration from the emission rate:

$$C = \frac{E_a \times A}{n \times V}$$

C = concentration of VOC in the reference room, in µg/m^3
E_a = area specific emission rate, in µg/m^{2}h
A = surface area of product in reference room, in m^2
n = air exchange rate, in changes per hour, here 0.5 h^{-1}
V = volume of the reference room, in m^3, here 30 m^3

Table 1.
Emission results of **Timbertech TT** after 28 days

Volatile organic compounds	CAS number	Retention time (min)	ID[1]	Emission rate ($\mu g/m^2h$)	Concentration in reference room ($\mu g/m^3$)	LCI_i ($\mu g/m^3$)	R_i (c_i/LCI_i)
TVOC ($C_6 - C_{16}$)	--	6.2 – 38.1	B	< 10	< 10	--	--
Volatile Carcinogens [2]		6.2 – 38.1					
No substances detected	--	--	B	< 1	< 1	--	--
VOC with LCI [3]		6.2 – 38.1					
No substances detected	--	--	B	< 2	< 5	--	--
∑ **VOC with LCI**	--	--	A	< 2	< 5	--	--
VOC without LCI [4]							
Cyclohexane, isothiocyanato-	1122-82-3	28.8	B	2	< 5	--	--
∑ **VOC without LCI**	--	--	B	2	< 5	--	--
SVOC ($C_{16} - C_{22}$) [5]		38.1- 50.0					
No substances detected	--	--	B	< 2	< 5	--	--
∑ **SVOC**	--	--	B	< 2	< 5	--	--
VVOC (< C_6) [6]		4.5 – 6.2					
Acetic Acid	64-19-7	5.7	A	19	15	1200	0.01
Cyclopentane	287-92-3	5.9	B	10	8	--	--
Formaldehyde [7]	50-00-0	--	A	< 2	< 5	100	--
Acetaldehyde [7]	75-07-0	--	A	< 2	< 5	1 200	--
∑ **VVOC**	--	--	A	29	23	--	
R = ∑ C_i / LCI_i [8]	--	--	--	--	--	--	0.01

[1] ID: A = quantified compound specific, B = quantified as toluene-equivalent
[2] Volatile carcinogens = VOCs according to EU Regulation No 1272/2008 Annex VI, cat 1A and 1B
[3] VOC with LCI = identified VOC-compound with LCI-value according to EU-LCI, Dec 2016
[4] VOC without LCI = VOC-compound without LCI-value or not identified.
[5] SVOC = semi-volatile organic compounds, as defined in ISO 16000-6 (not part of accreditation)
[6] VVOC = very volatile organic compounds, as defined in ISO 16000-6 (not part of accreditation)
[7] VVOC-aldehydes measured with DNPH samplers (ISO 16000-3)
[8] All VVOC, VOC, SVOC and carcinogens with LCI

Only VOC-compounds with an emission rate higher than 2 $\mu g/m^2h$ are listed in Table 1, carcinogenic compounds ≥ 1 $\mu g/m^3$. Only the compounds with a concentration in the reference room > 5 $\mu g/m^3$ are evaluated based on LCI (= lowest concentration of interest). TVOC expressed in $\mu g/m^3$ is the sum of all individual substances with concentrations ≥ 5 $\mu g/m^3$ (in toluene equivalents).

Quantification limit for TVOC is 10 $\mu g/m^2h$. Measurement uncertainty for VOC is 15 % (rel) and for formaldehyde 30 % (rel). Background of TVOC in the empty chamber was below 30 $\mu g/m^3$ and is subtracted.

See Appendix 1 for a gas chromatogram (FID spectra) and Appendix 2 for a photo of the test specimen.

Summary of the test results

The test results are summarized in Table 2.

Table 2.
Summary of the emission results after 28 days of **Timbertech TT**

Compounds	**Emission rate** ($\mu g/m^2h$)	**Concentration in reference room** (Floor scenario) ($\mu g/m^3$)
TVOC	< 10	< 10
∑ Carcinogenic VOCs	< 1	< 1
∑ VOC with LCI	< 2	< 5
∑ VOC without LCI	2	< 5
∑ VVOC	29	23
Formaldehyde	< 2	< 5
∑ SVOC	< 2	< 5
$R = \sum C_i / LCI_i$	0.01	

Evaluation of the test results

Byggvarubedömningen has criteria regarding Emissions to indoor environment. The emissions are to measured according to a standard method such as ISO 16000-9. The requirements for the *Recommended class* is that the requirements to one of the following systems are being met: Emicode EC1, Emicode EC1^{PLUS}, Blue Angel, M1 (RTS) or GUT.

Table 3.
The test results of **Timbertech TT** are compared to the relevant requirements in M1

Compounds	**Requirement M1** (mg/m^2h)	**Test Results** (mg/m^2h)	**Pass / Fail**
TVOC	< 0.2	**< 0.01**	**PASS**
Formaldehyde	< 0.05	**< 0.002**	**PASS**
CMR 1A+1B	< 0.005	**< 0.001**	**PASS**
Ammonia	< 0.03	not measured	--
Odour	≥ 0.0	not measured	--

The test results are in compliance with the tested requirements of M1 and meet the requirements for the *Recommended class*.

RISE Research Institutes of Sweden AB
Chemistry and Materials - Chemistry

Performed by

Signed by: Thomas Vaessen
Reason: I am the author of this document
Date & Time: 2018-04-09 11:06:06 +02:00

Thomas Vaessen

Examined by

Signed by: Tove Mali'n
Reason: I have reviewed this document
Date & Time: 2018-04-09 13:31:40 +02:00

Tove Mali´n

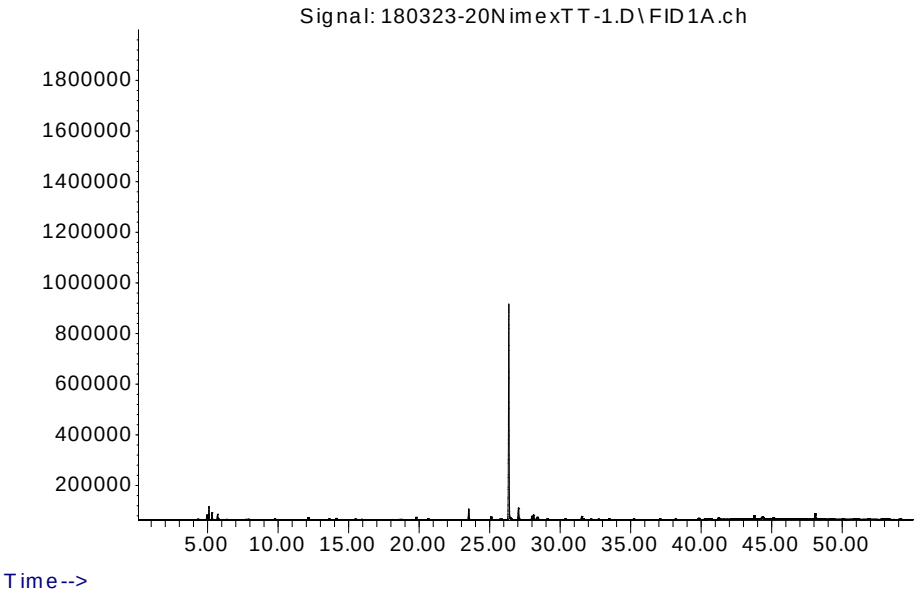
Appendices

1. Gas Chromatogram
2. Photo of the test specimen
3. Sampling report

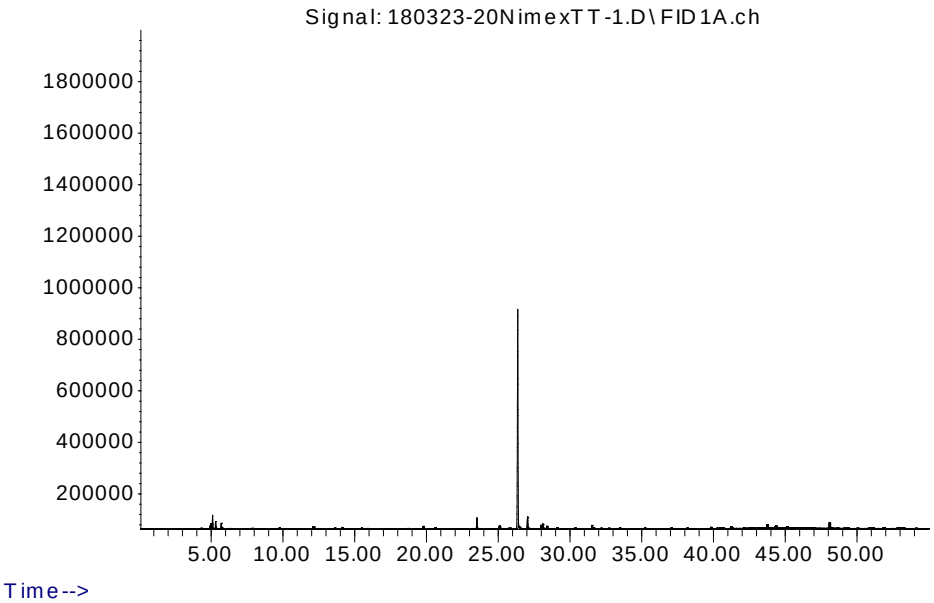
Appendix 1

Gas chromatogram

Timbertech TT Blank



Timbertech TT, after 28 days:



TVOC between C_6 and C_{16}, means compounds eluting between 6.2 and 38.1 minutes. The peak at 26 minutes is a contamination as it also is visible in the blank and is therefore not used in the analysis.

Appendix 2

Photo of test specimen

Timbertech TT