

Eurocol Tape AB
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Emission measurement after 28 days

(2 appendices)

Test object

One roll of a tape, dimension 50 mm x 25 m. The tape roll was sent by the commissioner to RISE.

Sample name: **etab 5525**
Batch No: 20147
Date of arrival: 2017-09-26

Assignment

Emission measurements 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).

For evaluation of test results the principle of shared risk is applied, i.e. for a max limit (\leq) a result \leq the limit complies and a result $>$ the limit does not comply (ILAC G8 section 2.7).

Method

The test was started 2017-09-27 by unrolling and discarding approximately 1.5 m of tape from the roll. The tape was then applied to a glass sheet of 250 x 400 mm giving an exposed surface area of 0.1 m². The specimen was placed in a conditioning room with controlled climate conditions of 23 ± 2 °C and 50 ± 5 % RH. The specimen was put into the chamber five days prior to air samplings. The emission samplings were carried out on 2017-10-20.

Test conditions in the chamber:

Test chamber volume: 0.250 m³, stainless steel
Temperature: 23 ± 1 °C
Relative Humidity: 50 ± 3 % RH
Area of test specimen: 0.10 m²
Area specific air flow rate: 1.25 m³/m²h
Air exchange rate: 0.5 h⁻¹
Air velocity at specimen surface: 0.1 – 0.3 m/s

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Tenax TA was used as adsorption medium for VOC. The Tenax tubes were thermally desorbed and analysed in accordance to SP 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 % methyl-poly-siloxane. 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 were 2.9 to 5.1 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/m³ and above.

The samplings of the aldehydes/ketones formaldehyde, acetaldehyde, acetone and propanal were carried out with DNPH samplers. The samplers were analysed according to accredited SP 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. The other aldehydes (butanal, pentanal, hexanal, benzaldehyde, 3-methylbenzaldehyde, 2-methylbenzaldehyde, 4-methylbenzaldehyde and 2,5-dimethylbenzaldehyde) were analyzed on GC-MS/FID by sampling on Tenax TA. Duplicate air samples were taken and the results are mean values. Sampled volumes were 32 and 48 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. Small area scenario, 1.5 m² is used in the calculations of the concentrations in the reference room.

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/m³
 E_a = area specific emission rate, in µg/m²h
 A = surface area of product in reference room, in m², here 1.5 m²
 n = air exchange rate, in changes per hour, here 0.5 h⁻¹
 V = volume of the model room, in m³, here 30 m³

Table 1.
Results of **etab 5525**, after 28 days:

Volatile organic compounds	CAS number	Retention time (min)	ID ¹	Emission rate ($\mu\text{g}/\text{m}^2\text{h}$)	Concentration in reference room ($\mu\text{g}/\text{m}^3$)	LCI _i ($\mu\text{g}/\text{m}^3$)	R _i (c_i/LCI_i)
TVOC	--	8.1 – 44.1	B	11	< 5	--	--
Volatile Carcinogens ²		8.1 – 44.1					
No substances detected	--	--	B	< 1	< 1	--	--
VOC with LCI ³		8.1 – 44.1					
1-Butanol	71-36-3	7.4	A	20	< 5	--	--
Σ VOC with LCI	--	--	A	20	< 5	--	--
VOC without LCI ⁴		8.1 – 44.1					
No substances detected	--	--	--	--	--	--	--
Σ VOC without LCI	--	--	B	< 5	< 5	--	--
SVOC ⁵		44.1 – 50.3					
No substances detected	--	--	--	--	--	--	--
Σ SVOC	--	--	B	< 5	< 5	--	--
VVOC ⁶		5.0 – 8.1					
Formaldehyde ⁷	50-00-0	--	A	< 1	< 5	100	--
Acetaldehyde ⁷	75-07-0	--	A	< 1	< 5	1200	
Acetone ⁷	67-64-1	--	A	< 1	< 5	1200	--
Σ VVOC	--	--	A	< 5	< 5	--	--
$R = \Sigma C_i / \text{LCI}_i$ 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

COMMENT:

Only VOC-compounds with an emission rate higher than $5 \mu\text{g}/\text{m}^2\text{h}$ are listed in the table, carcinogens $> 1 \mu\text{g}/\text{m}^2\text{h}$. Only compounds with a concentration in the model room $\geq 5 \mu\text{g}/\text{m}^3$ are evaluated based on LCI (= lowest concentration of interest) i.e. none here.

Quantification limit for TVOC is $10 \mu\text{g}/\text{m}^2\text{h}$. Measurement uncertainty for TVOC is 15 % (rel) and for formaldehyde 30 % (rel). Background of TVOC in the empty chamber was below $20 \mu\text{g}/\text{m}^3$ and is subtracted. TVOC is the sum of all individual substances with concentrations $\geq 1 \mu\text{g}/\text{m}^3$ (in toluene equivalents) within the retention range $C_6 - C_{16}$.

Summary of the test results

The test results are summarized in Table 2.

Table 2.

Summary of the emission results after 28 days of **etab 5525**

Compounds	Emission rate ($\mu\text{g}/\text{m}^2\text{h}$)	Concentration in reference room (small area scenario) ($\mu\text{g}/\text{m}^3$)
TVOC	11	< 5
Σ Carcinogenic VOCs	< 1	< 1
Σ VOC with LCI	20	< 5
Σ VOC without LCI	< 5	< 5
Σ VVOC	< 5	< 5
Σ SVOC	< 5	< 5
$R = \Sigma C_i / \text{LCI}_i$	< 0.01	

Evaluation of the test results

SINTEF Technical Approvals has emission criteria according to Table 3.

Table 3.

The test results of **etab 5525** are compared to the requirements of SINTEF for floor/ceiling, wall and small areas:

Compounds	Requirement Sintef ($\mu\text{g}/\text{m}^2\text{h}$)	Test Results ($\mu\text{g}/\text{m}^2\text{h}$)	Pass / Fail
TVOC	< 200	11	PASS
Formaldehyde	< 50	< 1	PASS
Sum of carcinogenic VOC	< 10	< 1	PASS

The test results are in compliance with the requirements of SINTEF.

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

RISE Research Institutes of Sweden AB
Chemistry and Materials - Chemistry

Performed by

Examined by

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Appendices

1. Gas chromatogram
2. Photo of test specimen

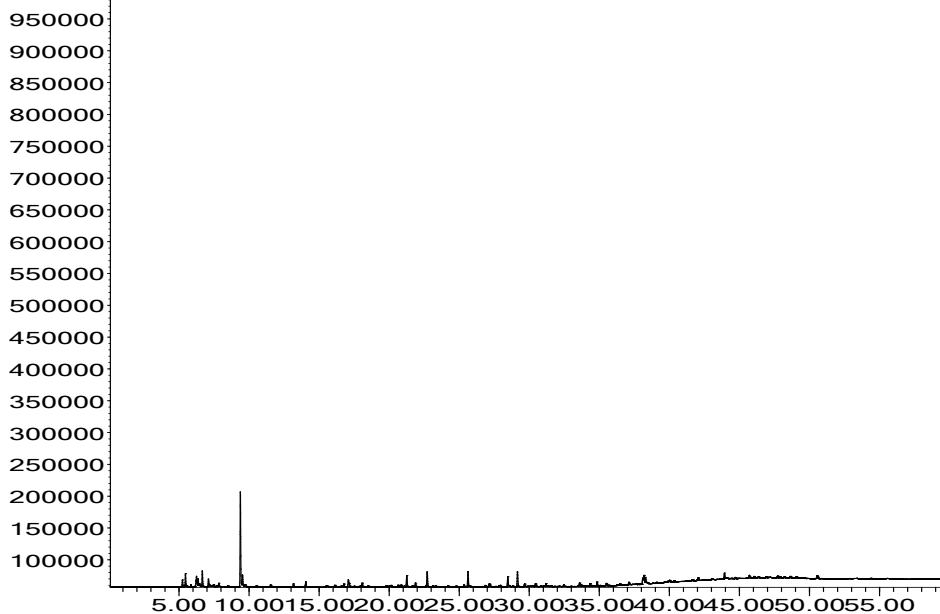
Appendix 1

Gas chromatogram

etab 5525, after 28 days
(sampled volume 5.1L)

Abundance

Signal: 171030-04etab2.D\FID1A.CH



Time-->

Appendix 2

Photo of the test specimen



etab 5525