REPORT

Issued by an Accredited Testing Laboratory

Contact person RISE
Ulrika Johansson
Division Materials and Production
+46 10 516 53 22
ulrika.johansson@ri.se

Date: 2021-01-20
Reference: O100152-111658

HomebyHemp AB
c/o Woldemariam
Henrik Smithsgatan 1
Lht 1101
211 56 MALMÖ

Emission measurements after 28 days

(1 appendix)

Test object

Sample of an isolation for wall, floor and ceiling.

Product name:	**Ekolution® Hampfiberisolering**
Manufacturer:	Homebyhemp AB
Production date:	2020-10-29
Batch No:	0001
Size of sample:	2 pieces, 1200x600x45 mm
Package:	Plastic foil
Date of arrival:	2020-11-17

Assignment

Emission measurements according to SS-EN 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).

The results of the measurements will be used for registration to Byggvarubedömningen.

Method

The test was started on November 17 by unpacking the sample. A test specimen of 52 x 52 cm was cut out from one of the boards. The back and cut edges were sealed with aluminium foil and tape leaving a total exposed surface area of 0.27 m^2. The specimen was placed in a room with controlled climate conditions of 23 ± 3 °C and 50 ± 5 % RH. The test specimen was placed in the emission chamber four days prior to the air sampling.

Air samplings after 28 days of conditioning were carried out on 2020-12-15.

Conditions of the test in the emission chamber:

Test chamber volume:	0.27 m^3
Area of test specimen:	0.27 m^2
Air exchange rate:	0.5 h^{-1}
Area specific air change rate:	0.5 m^3/m^2 h.
Temperature:	23 ± 1 °C
Relative humidity:	50 ± 5 % RH
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 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 % 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 2.8 – 6.2 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 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. Duplicate air samples were taken and the results are mean values. Sampled volumes were 32 – 37 L.

Results

The results relate only to the items tested.

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 2 m^2 and very small area, like sealant, is 0.2 m^2. Wall 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
V = volume of the reference room, in m^3

Table 1.
Emission results for the product **Ekolution® Hampfiberisolering** 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 – 37.9	B	22	46	--	--
Volatile Carcinogens [2]		6.2 – 37.9					
No substances detected	--	--	B	< 1	< 1	--	--
VOC with LCI [3]		6.2 – 37.9					
Acetic acid (VVOC)	64-19-7	5.5	A	40	84	1200	0.07
1-Hexanol, 2-ethyl-	104-76-7	9.4	A	7	15	300	0.05
∑ **VOC with LCI**	--	--	A	47	99	--	--
VOC without LCI [4]		6.2 – 37.9					
No substances detected	--	--	B	< 2	<5	--	--
∑ **VOC without LCI**	--	--	B	< 2	< 5	--	--
SVOC ($C_{16} - C_{22}$) [5]		37.9 – 51.3					
No substances detected	--	--	B	< 2	< 5	--	--
∑ **SVOC**	--	--	B	< 2	< 5	--	--
VVOC (< C_6) [6]		4.5 – 6.2					
Formaldehyde [7]	50-00-0	--	A	1	< 5	100	--
Acetaldehyde [7]	75-07-0	--	A	< 1	< 5	1200	--
∑ **VVOC**	--	--	B	1	< 5	--	--
R = ∑ C_i / LCI_i [8]	--	--	--	--	--	--	0.12

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, July 2018
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 2 $\mu g/m^2h$ are listed in Table 1, carcinogenic compounds $\geq$ 1 $\mu g/m^2h$. Only compounds with a concentration in the reference room $\geq$ 5 $\mu g/m^3$ are evaluated based on LCI (= lowest concentration of interest).

TVOC expressed in $\mu g/m^3$ and $\mu g/m^2h$ is the sum of all individual substances with concentrations $\geq$ 5 $\mu g/m^3$ (in toluene equivalents) in the reference room.

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

See Appendix 1 for gas chromatograms (FID spectra)

Summary of the test results

The test results are summarized in Table 2.

Table 2.
Summary of the emission results after 28 days for the product **Ekolution® Hampfiberisolering**

Compounds	**Emission rate** (µg/m^{2}h)	**Concentration in reference room** (wall area scenario) (µg/m^3)
TVOC	22	46
∑ Carcinogenic VOCs	< 1	< 1
∑ VOC with LCI	47	99
∑ VOC without LCI	< 2	< 5
∑ VVOC	1	< 5
Formaldehyde	1	< 5
∑ SVOC	< 2	< 5
$R = \sum C_i / LCI_i$	0.12	

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.

Decision rule: When comparing the measured results and requirement level, the average value of the measured results has been compared with the requirement level. No account is taken to the measurement uncertainty.

Table 3.
The test results of the product **Ekolution® Hampfiberisolering** are compared to the relevant requirements in M1

Compounds	Requirement M1 (wall area) (mg/m^2h)	Test Results (mg/m^2h)	Pass / Fail
TVOC	< 0.2	**0.022**	**PASS**
Formaldehyde	< 0.05	**0.001**	**PASS**
CMR 1A+1B	< 0.001	**< 0.001**	**PASS**
Single VOC ($\mu g/m^3$)	≤ EU-LCI	**< EU-LCI**	**PASS**
Ammonia	< 0.03	not measured	--
Odour	≥ 0.0	not measured	--

Conclusion

The test results complies with the tested requirements of M1. The product meets the requirements of Byggvarubedömningen for the *Recommened class*.

RISE Research Institutes of Sweden AB
Chemistry, Biomaterials and Textiles - Chemical and Biological Safety

Performed by

Signed by: Ulrika Johansson
Reason: I am the author of this document
Date & Time: 2021-01-20 15:12:19 +01:00

Ulrika Johansson

Examined by

Signed by: Conny Haraldsson
Reason: I have reviewed this document
Date & Time: 2021-01-20 16:03:18 +01:00

Conny Haraldsson

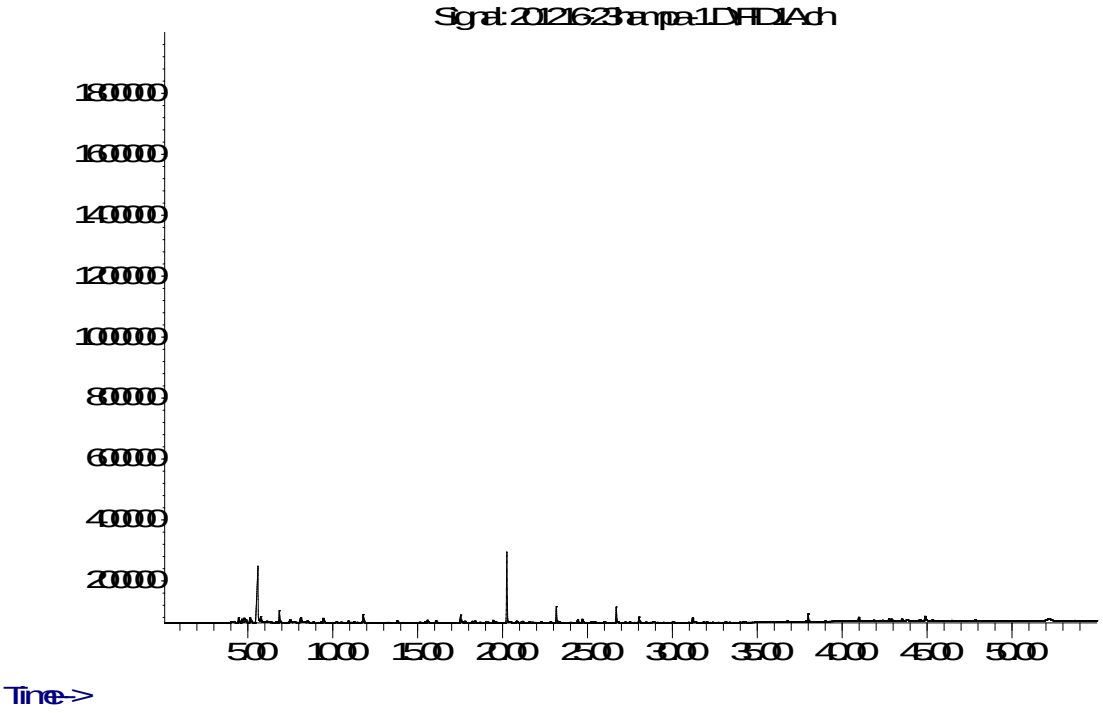
Appendix

1. Gas chromatogram

Appendix 1

Gas chromatogram

Ekolution® Hampfiberisolering after 28 days



TVOC between C_6 and C_{16}, means compounds eluting between 6.2 and 37.9 minutes.