ARDEX SN
Emission measurements for the Finnish Classification of Building Materials

FINAS
Finnish Accreditation Service
T001 (EN ISO/IEC 17025)

Requested by: Ardex Oy

VTT EXPERT SERVICES LTD

Requested by

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Order

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Assignment

ARDEX SN
Emission measurements for the Finnish Classification of Building Materials

Emission measurements of volatile organic compounds (VOC, TVOC), carcinogens, ammonia, and formaldehyde and sensory evaluation of the material were performed for test specimens conditioned for four weeks in standard conditions /1/.

Product

Product type	sealant
Product name	**ARDEX SN**
Production date	01/2013 (Lot. 0608302)
Sample received	19.3.2013
Packaging / Transport	0.31 L tube / delivered by customer
Test specimen preparation	In glass bar, width 10 mm, wet layer thickness 3 mm
Test period started, date	3.4.2013
Conditions during ageing	Temperature (23±1)°C, RH (50±5) %
Emission sampling, date Sensory evaluation, date	2.5.2013 3.5.2013

Chamber technique

	Chamber volume	Air change/ supply air rate	Temperature	RH	Test specimen area	Area specific air flow rate
Chemical emissions	1 m^3	0.5 h^{-1}	(23±1) °C	(50±5) %	0.042 m^2	12 $m^3/(m^2\ h)$
Sensory evaluation	0.1 m^3	0.9 l/s	(23±1) °C	(50±5) %	0.019 m^2	173 $m^3/(m^2\ h)$

Emission sampling and analytical methods

	Method	Adsorbent/ absorbent	Sampling volume, L	Quantification/ Analysis method	Lowest detection limit
TVOC	RTESIS495 RTESIS995	Tenax TA 60/80 mesh	2.5-4.8	Quantification from FID-chromatogram as toluene equivalent. Column HP-PONA, 50 m x 0,2 mm x 0,5 µm	1 µg/m³
Formaldehyde	RTESIS101 analysis: EN 717-1	Diluted sulphuric acid	273-292	Spectrophotometric analysis with acetylacetone method	0.005 mg/m³
Ammonia	RTESIS295*	Diluted sulphuric acid		Ion selective electrode	0.005 mg/m³
Sensory evaluation		Untrained panel of 15 members			

*) method is accredited

VOCs were adsorbed on Tenax TA adsorbent /2/. VOC samples were analysed with a gas chromatograph after thermal desorption /3/. The gas chromatograph is equipped with a flame ionisation detector (FID) and a mass selective detector (MSD). The total amount of VOCs (TVOC) was calculated from the total area of the FID-chromatogram between hexane and hexadecane using toluene response factor. Single VOCs were identified from the mass selective detector total ion chromatogram using Wiley 275 spectral library and quantified from the FID-chromatogram as toluene equivalents. Identifications are not confirmed with pure standards. The lowest detection limit of the measuring method for single VOCs is on the level of 1 µg/m³.

Formaldehyde and ammonia were absorbed in dilute sulphuric acid. Formaldehyde was analysed spectrophotometrically with acetylacetone method /4-5/. Ammonia was analysed potentiometrically with ammonia specific electrode /6/.

An untrained panel of 15 members performed the sensory evaluation of the product /1/. The panellists evaluated the acceptability of the chamber outlet air in scale clearly unacceptable … just unacceptable (-1…-0.1) – just acceptable … fully acceptable (+0.1…+1).

Results

Results are presented in Tables 1 - 3.

Table 1. Results of the emission measurements.

	Specific Emission Rate, SER				
	TVOC	**Formaldehyde**	**Ammonia**	**Carcinogens**	**Sensory evaluation**
	mg/(m² h) [1)]	mg/(m² h)	mg/(m² h)	mg/(m² h) [1)]	Acceptability
ARDEX SN	0.37	< 0.03	0.04	< 0.005	+ 0.8
M1 classification criteria	< 0.2	< 0.05	< 0.03	< 0.005	> +0.1

1) As toluene equivalents

Table 2. *The emissions of single VOCs between C_6-C_{16} as toluene equivalent (Specific Emission Rate SER >0.020 mg/(m²h)).*

			SER, mg/(m² h)
RT, min	**Compound**	**CAS**	**ARDEX SN**
7.3-7.8	Acetic acid	64-19-7	0.044
17.00	Cyclotrisiloxane, hexamethyl	541-05-9	0.028
35.79	Cyclohexasiloxane, dodecamethyl-	540-97-6	0.144
40.95	Cycloheptasiloxane, tetradecamethyl-	107-50-6	0.134
	TVOC		**0.37**
	Identified		0.36
	Identification percent		96%

Table 3. *The emissions of single VOCs outside the frame C_6-C_{16} as toluene equivalent (Specific Emission Rate SER >0.020 mg/(m²h)).*

			SER, mg/(m² h)
RT, min	**Compound**	**CAS**	**ARDEX SN**
45.42	Cyclooctasiloxane, hexadecamethyl-	556-68-3	0.033

Measurement uncertainty

TVOC/VOC emission factor	±35 %
Formaldehyde emission factor	±25 %
Ammonia emission factor	> ±35 %

References

1. Protocol for Chemical and Sensory Testing of Building Materials. (www.rts.fi)
2. In-house method RTESIS495, modified from standard EN ISO 16000-9.
3. In-house method RTESIS995, modified from standard EN ISO 16000-6.
4. EN 717-1. Wood based panels - Determination of formaldehyde release - Part 1: Formaldehyde emission by the chamber method October 2004.
5. In-house method RTESIS101. Determination of formaldehyde using spectrometric acetylacetone-method.
6. In-house method RTESIS295. Determination of ammonium concentration in indoor air.

Espoo, 7.6.2013

Hanna Kajander
Expert

Appendices

Appendix 1:	VOC sample FID-chromatogram Individual results of the sensory evaluation

Distribution

Customer	Original
Archive	Original

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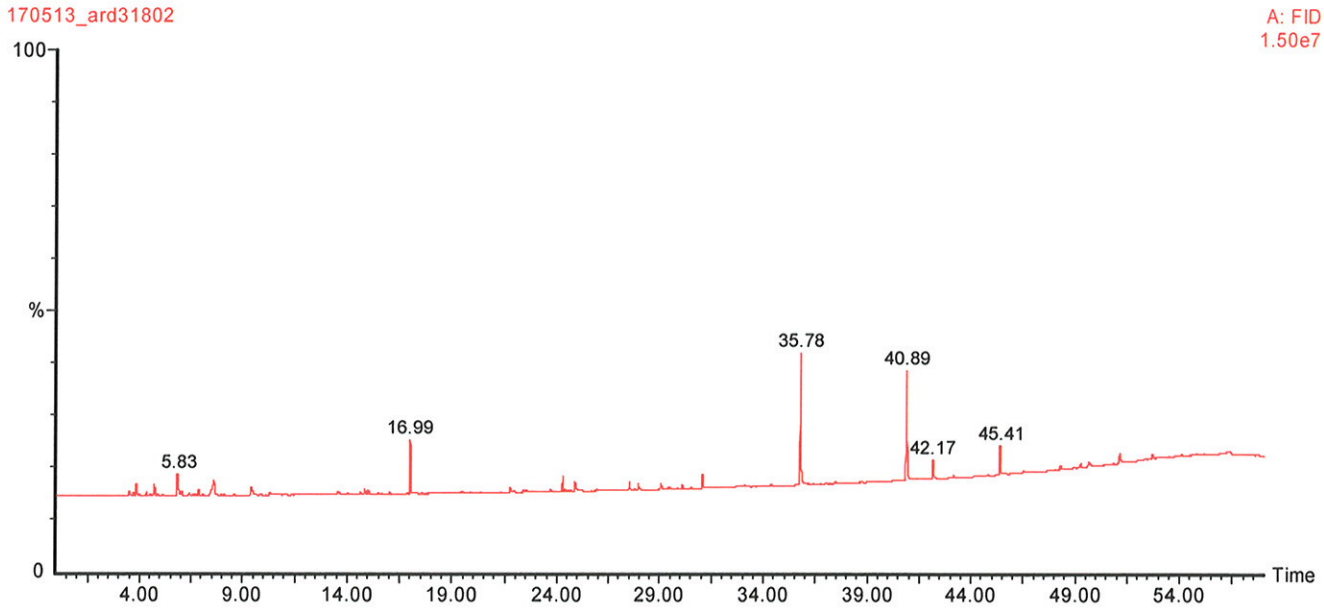
ARDEX SN VOC sample FID-chromatogram



Individual results of the sensory evaluation