



## The emission measurements for the Finnish classification of Building Materials

| Requested by: Tupler



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**Order** 14.8.2006, Klaus Gummerus

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**Object** **The emission measurements for the Finnish classification of Building Materials.**

Emission measurements of volatile organic compounds (VOC), carcinogens, ammonia, and formaldehyde and sensory evaluation of the material were measured after four weeks<sup>1</sup> of production /1/.

<sup>1</sup>Sample age is calculated from the time point when the sample is unwrapped from the package at VTT. It does not refer to the manufacturing date of the material.

**Product**

Product type (by the manufacturer)	Carpet underlay
Product name (by the manufacturer)	<b>Tuplex</b>
Production date (by the manufacturer)	week 32
Sending date (by the manufacturer)	14.8.2006
Description of packaging /transport	cardboard/plastic
Product received at the testing laboratory, date	17.8.2006
Sample preparation/deviations	-
Test period started, date	28.8.2006
Conditions during ageing	Temperature 23±1 °C, rel. humidity 50±5 %
Emission sampling, date	25-26.9.2006

**Chamber technique**

	Chamber Volume and type	Air change rate	Temperature °C	Rel humidity %	test specimen area or loading factor
<b>VOC, TVOC, formaldehyde, ammonia</b>					
<b>Tuplex</b>	0,5 m <sup>3</sup>	0,5 h <sup>-1</sup>	23±1	50±5	0,23 m <sup>2</sup>

Sensory evaluation	Chamber Volume and type	Supply air rate	Temperature °C	Rel humidity %	test specimen area or loading factor
<b>Tuplex</b>	0,1 m <sup>3</sup>	0,9 l/s	23±1	50±5	0,70 m <sup>2</sup>

### Emission sampling and analytical methods

Indoor Air Chemistry is a testing laboratory T018 accredited by the Finnish Accreditation Service; FINAS.

	Method	Adsorbent/absorbent	Sampling volume	Quantification/ Analysis method	Detection limit of the method used
<b>VOC</b>	RTESIS495* RTESIS995*	Tenax TA 60/80 mesh	2,6–3,4	Quantification from FID-chromatogram as toluene equivalent	1 µg/m <sup>3</sup>
<b>Formaldehyde</b>	RTESIS101 EN 717-1	diluted sulphuric acid	256–260	Spectrophotometric analysis with acetyl acetone method	0,01 mg/m <sup>3</sup>
<b>Ammonia</b>	RTESIS295*	diluted sulphuric acid	256–260	Ion selective electrode	0,005 mg/m <sup>3</sup>
<b>Sensory evaluation</b>	Untrained panel of 5 persons				

<sup>\*)</sup> method is accredited

VOCs were adsorbed on Tenax TA /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 detection limit of the measuring method is 1 µg/m<sup>3</sup>. 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 and quantified from the FID-chromatogram as toluene equivalents. Identifications are not confirmed with pure standards.

Formaldehyde was absorbed in dilute sulphuric acid and analysed with spectrometric acetylacetone method /4-5/. The detection limit of the measuring method is 0,01 mg/m<sup>3</sup>. Ammonia was absorbed in dilute sulphuric acid and analysed with ammonium specific electrode /6/. The Detection limit of the measuring method is 0,005 mg/m<sup>3</sup>.

An untrained panel of five persons performed the sensory evaluation of the sample /1/. The panellists evaluated the acceptability of the chamber air in scale not acceptable (-1...-0,1) – acceptable (+0,1...+1).



## Results

Results are presented in Tables 1-3.

**Table 1.** Results of the emission measurements

	TVOC	Formaldehyde	Ammonia	Carcinogens SER > 0,002 mg/(m <sup>2</sup> h)	Sensory evaluation
	mg/(m <sup>2</sup> h) as toluene equivalents between C <sub>6</sub> -C <sub>16</sub>	mg/(m <sup>2</sup> h)	mg/(m <sup>2</sup> h)	mg/(m <sup>2</sup> h) as toluene equivalents or MS quantification	Average of acceptability
<b>Tuplex</b>	0,030	<0,005	<0,005	<0,005	+0,7

**Table 2.** The emissions of single VOCs inside the frame C<sub>6</sub>-C<sub>16</sub> >0,005 mg/(m<sup>2</sup> h) as toluene equivalent:

Ret time	COMPOUND	CAS	mg/(m <sup>2</sup> h)
			<b>Tuplex</b>
27.46	Dodecane	112-40-3	0,007
30.10	Tridecane	629-50-5	0,009
		<b>TVOC</b>	<b>0,030</b>
		Identified	0,028
		%	93

**Table 3.** The emissions of single VOCs outside the frame C<sub>6</sub>-C<sub>16</sub> >0,005 mg/(m<sup>2</sup> h) as toluene equivalent:

Ret time	COMPOUND	CAS	mg/(m <sup>2</sup> h)
			<b>Tuplex</b>
4.99	Pentane	109-66-0	0,027

The emissions of other single VOCs inside and outside the frame C<sub>6</sub>-C<sub>16</sub> were <0,005 mg/(m<sup>2</sup> h) as toluene equivalent.

## Measurement uncertainty


TVOC/VOC emission factor	±25 %
Formaldehyde emission factor	±30 %
Ammonia emission factor	±25 %

## References

1. Protocol for Chemical and Sensory Testing of Building Materials. ([www.rts.fi](http://www.rts.fi))
2. VTT Building and Transport method description RTESIS495. Material emissions. Determination of volatile organic compounds (VOC) using chamber technique.
3. VTT Building and Transport method description RTESIS995. Determination of volatile organic compounds (VOC) from Tenax TA using GC-FID/MSD-technique.

4. EN 717-1. Wood based panels - Determination of formaldehyde release - Part 1: Formaldehyde emission by the chamber method October 2004.
5. VTT Building and Transport method description RTESIS101. Determination of formaldehyde using spectrometric acetylacetone-method (in Finnish).
6. VTT Building and Transport method description RTESIS295. Determination of ammonium concentration in indoor air.

Espoo, 17.10.2006

  
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**APPENDICES**

Chromatogram

**DISTRIBUTION**

Customer  
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Tuplex

