

**Test Report**  
**Muovihaka Oy**  
Product Emissions in  
accordance with the Swedish  
Building Material Assessment  
**Ultima graphite**

July 2012

**Client:** **Muovihaka Oy**  
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**Date:** 26 July 2012

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## Table of Contents

<b>1</b>	<b>Description of the Applied Testing Method</b>	<b>3</b>
1.1	Test Specimen	3
1.2	Test Chamber	3
1.3	Sampling, Desorption, Analyses	3
1.4	Uncertainty of the test method	4
<b>2</b>	<b>Results</b>	<b>5</b>
2.1	Emissions Test after 4 Weeks	5
2.2	Emissions Test after 26 Weeks	<b>Error! Bookmark not defined.</b>
<b>3</b>	<b>Interpretation of the Results</b>	<b>5</b>

## Introduction

On 7 June 2012 Eurofins Product Testing A/S received a sample of a flooring mat named

**Ultima graphite**

Date of production: 24 May 2012

for emissions testing in accordance with the Swedish Building Material Assessment. The sample was clearly labelled, properly packaged and not damaged. Testing was carried out in the laboratories of Eurofins Product Testing A/S. Before starting the testing procedure on 14 June 2012 the sample had been stored unopened at room temperature.

# 1 Description of the Applied Testing Method

The applied method complies with the test method of the Swedish Building Material Assessment (version 2011) which is based on ISO 16000-3, ISO 16000-6, 16000-9, 16000-11, ISO 16017-1. The internal method numbers are: 9810; 9811, 9812, 2808, 4430 , 8400.

## 1.1 Test Specimen

A sample was sent by the client to the laboratory of Eurofins Product Testing A/S in an airtight package. The package was opened and a test specimen was cut out. Edges and back were covered with aluminium foil. The test specimen was transferred into a test chamber immediately (internal method no.: 9810).

## 1.2 Test Chamber

The test chamber was consisting of stainless steel and had a volume of 119 litres. The air clean-up was realized in multiple steps. Before loading the chamber a blank check of the empty chamber was performed. The operation parameters were 23 °C, 50 % relative air humidity (in the supply air) with an air exchange rate of ½ per hour. The loading of the test chamber was 0.4 m<sup>2</sup> test specimen per m<sup>3</sup> air volume (internal method 9811).

## 1.3 Sampling, Desorption, Analyses

### 1.3.1 VOC Emissions Testing after 4 Weeks

The emissions of organic compounds were tested by drawing air samples from the chamber outlet through Tenax TA tubes (main tube and backup tube). Analyses were done by thermal desorption and gas chromatography / mass spectroscopy (internal methods no.: 9812 / 2808). All single substances were identified if the toluene equivalent in the Total Ion Chromatogram (TIC) exceeded 2 µg/m<sup>3</sup>. Quantification was done with the respective response factor and the TIC signal, or in case of overlapping peaks by calculating with fragment ions. All non-identified substances were quantified as toluene equivalent if giving more than 2 µg/m<sup>3</sup>.

The results of the individual substances were calculated in three groups depending on their appearance in a gas chromatogram when analysing with a non-polar column (HP-1):

- Volatile organic compounds VOC: All substances appearing between these limits.
- Very volatile organic compounds VVOC: All substances appearing before n-hexane (n-C<sub>6</sub>).
- Semi-volatile organic compounds SVOC: All substances appearing after n-hexadecane (n-C<sub>16</sub>).

Calculation of the TVOC (Total Volatile Organic Compounds) was done by addition of the results of all substances between C<sub>6</sub> and C<sub>16</sub> as toluene equivalent, as defined in ISO 16000-6.

Calculation of the TSVOC (Total Semi-Volatile Organic Compounds) was done by addition of the results of all substances between C<sub>16</sub> and C<sub>22</sub> as toluene equivalent, as defined in ISO 16000-6.

Calculation of the TVVOC (Total Very Volatile Organic Compounds) was done by addition of the results of all substances appearing before C<sub>6</sub> as toluene equivalent, as defined in ISO 16000-6.

This test covered only substances that can be adsorbed on Tenax TA and that can be thermally desorbed. If other emissions occurred then these could not be monitored (or with limited reliability only).

The results are only valid for the tested sample(s).

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### 1.3.2 Testing of Aldehydes after 4 Weeks

The presence of aldehydes C<sub>1</sub> – C<sub>4</sub> was tested by drawing air samples from the chamber outlet through DNPH-coated silicagel tubes. Analysis was done by solvent desorption, HPLC and UV-/diode array detection (ISO 16000-3, internal methods no.: 9812 / 8400).

The absence of the aldehydes was stated if the specific wavelength UV detector response was lacking at the specific retention time in the chromatogram. Otherwise it was checked whether the detection limit was exceeded. In this case the identity was finally checked by comparing full scan sample UV spectra with full scan standard UV spectra.

### 1.3.1 Testing of Ammonia after 4 Weeks

The presence of ammonia was tested by drawing air samples from the chamber outlet through silicagel tubes coated with sulphuric acid. Analysis was done by solvent desorption and UV/VIS spectroscopy (internal methods: 9812 / 4430).

The absence of ammonia was stated if the signal was lacking at the specific wavelength. Otherwise it was checked whether the detection limit was exceeded.

### 1.3.2 Accreditation

The testing methods described above have been accredited (EN ISO/IEC 17025:2005) by DANAK (no. 522). But some parameters are not yet covered by that accreditation. It is difficult to obtain accreditation for complex mixtures of substances. At present the accreditation does not cover the parameters marked with a note \*. But the analysis was done for these parameters at the same level of quality as for the accredited parameters.

## 1.4 Uncertainty of the test method

The relative standard deviation of the test method is amounted to 22% (RSD). The expanded uncertainty U<sub>m</sub> is 45% and equals 2 x RSD%, see also [www.eurofins.dk](http://www.eurofins.dk), search: Uncertainty

## 2 Results

### 2.1 Emissions Test after 4 Weeks

Ultima graphite	CAS No.	Retention time min	ID-Cat.	Concentration $\mu\text{g}/\text{m}^3$	Emission rate $\mu\text{g}/(\text{m}^2\cdot\text{h})$	Toluene equivalent $\mu\text{g}/\text{m}^3$	Limit value ** $\mu\text{g}/(\text{m}^2\cdot\text{h})$
<b>TVOC (C<sub>6</sub>-C<sub>16</sub>)</b> as toluene equivalent				12	<b>15</b>	12	200
<b>Single VOC Substance:</b>							
2,2,4,6,6-Pentamethylheptane	13475-82-6	7.92	1	4.9	<b>6.1</b>	5.6	-
n-Dodecane	112-40-3	10.57	1	2.0	<b>2.5</b>	2.7	-
n-Tridecane *	629-50-5	11.62	2	3.4	<b>4.3</b>	3.4	-
<b>Total VVOC (&lt; n-C<sub>6</sub>)</b>				< 2	<b>&lt; 3</b>	< 2	-
<b>Single VVOC Substance:</b>							
n.d.	-	-	-	< 2	<b>&lt; 3</b>	< 2	-
<b>Total SVOC (&gt; n-C<sub>16</sub>)</b>				< 2	<b>&lt; 3</b>	< 2	-
<b>Single SVOC Substance:</b>							
n.d.	-	-	-	< 2	<b>&lt; 3</b>	< 2	-
<b>Other target compounds</b>							
Formaldehyde	50-00-0	-	-	< 3	<b>&lt; 4</b>	-	50
Ammonia	7664-41-7	-	-	< 10	<b>&lt; 20</b>	-	

n.d. Not detected

< Means less than

\* Not a part of our accreditation. See 1.3.2 Accreditation.

\*\* Valid for the test after 26 weeks

#### Categories of identity:

- 1 = definitely identified, specifically calibrated
- 2 = identified by comparison with a mass spectrum obtained from a library, identity supported by other information, calibrated as toluene equivalent
- 3 = identified by comparison with a mass spectrum obtained from a library, calibrated as toluene equivalent
- 4 = not identified, calibrated as toluene equivalent

## 3 Interpretation of the Results

The results of **Ultima graphite** can be summarised as follows:

- The Total VOC ("TVOC") after 4 weeks was **below** the recommended limit of 200  $\mu\text{g}/\text{m}^2\text{h}$ .
- The formaldehyde emission after 4 weeks was **below** the recommended limit of 50  $\mu\text{g}/\text{m}^2\text{h}$ .

The tested product **Ultima graphite** complies with the requirements of the Swedish Building Material Assessment (version 2011).

The results are only valid for the tested sample(s).

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