ANALYSIS REPORT

Customer:	Suomen Luonnonmaalit Oy	Address:	Upokaskuja 6-8 01450 Vantaa (Tuusula)		
Contact:	Lauri Koski				
Date:	08.08.2020	Reference	Robert john		
Arrived:	11.10.2019 part 1, 15.8.2020 part 2 (5 L)				
Subject:	VOC analyses looking for the paint to clean the air in the test chamber				

Background:

Reduction of the Volatile Organic Compounds from air in the test chamber when light is added.

Sample:

Lab ID	Sample name	Description	Date
012-3	Auro 328	Ilmaa puhdistava seinämaali, 5 L	15.8.2020

Task: Measurements:

Looking for the reduction in test chamber air when a 0,25 m 2 of wall is painted using "ilmaa puhdistava seinämaali. This was performed during a long period of measurements taken by SPME CAR/PDMS 75 μ m or PDMS 100 μ m. It will be shown that the paint cleans up the air in the test chamber as the producer claims.

Plyviási terveellinen sisäilma. Huo-Pysviási terveellinen sisäilma. Huoneima puhdistavaa maalia käytetään neima puhdistavaa maalia käytetään neissa, koleleissa, olo- ja makuuhuoneissa, lastenhuoneissa sekä kellaritibissa kaali hajottaa ruuanhajun sekä huonkalujen, mattojen ja tupakan eritämät hajut. Maali hajottaa myös epäuhaudet esimerkiksi orgaaniset yhdislete kulten liuotinhöyryt ja formaldehyön, sekä mikro-organismit kuten baiteerii ja homeen.

Senámazin ertyinen raaka-aineyhdisleimä toimi katayasatorina, joka valon
avila pilkkoo ilman hajut ja epäpuhlaukti neutraaliksi aineeksi. Paras
leho saavutetaan päävänvalolla, mutta
lanovaloiähteetkin toimivat. Hajottamisposessi ei helikkene, vaikutusaste
psyy seykermöken koko käyttöiän
väkona. Ilma liikkumista tarvitaan,
pta puhdistettava ilma joutuisi koskelitrain maalatun seinän kanssa.

Kun hainki senä.

Kun hankt tämän tuotteen voit olla varta etei tuoneilmaan vapaudu haitaltia yhdistelä, vaan maali aktiivisesti sa haitallissa aineita huoneilmaa sangasiana siaallman puhtauden

SE
Ständigt ren inomhusluft. Färgen
som renar inomhusluften används
på väggar i skolor, mötesrum, hotell,
vardagsrum och sovrum, barnkammare
och källarutrymmen. Färgen bryter ner
matos och lukter från möbler, mattor
och tobak. Färgen bryter också ner
orenheter, till exempel organiska föreningar såsom lösningsmedelsånga och
formaldehyd, samt mikroorganismer
såsom bakterier och mögel.

Väggfärgens speciella kombination av råvaror fungerar som en katalysator som med hjälp av dagsljus bryter ner inomhusluftens orenheter till neutrala ämnen. Den bästa effekten uppnås med dagsljus men artificiell belysning fungerar också. Nedbrytningsprocessen försvagas inte med tiden utan är konstant över hela den målade ytan under hela dess livstid. Rummet behöver regelbunden luftväxling för att luften ska komma i kontakt med den målade väggytan.

Denna väggfärg är ett tryggt val; den emitterar garanterat inga hälsovådliga föreningar. Färgen minskar istället aktivt orenheter i inomhusluften och du kan vara säker på att luften du och din familij andas är ren.





Picture 1. A picture of the supplied paint that the manufacturer specifies to be able to clean the air. Below a picture of the painted items inside the glass chamber.

Experimental

Sample preparation

The sample was used to paint wood pieces, 0.25 m², and the painted wood items was put into a 167 liters test chamber made of glass. The chamber was dark for a period and the VOC levels were measured. Then we introduced light to simulate daylight. We only used normal lights that you can found in any house. When the light was applied the concentration of the VOC compounds were reduced. It can be seen from the SPME runs that we performed during a period of 1 month.

SPME sampling

The SPME fiber 75µm CAR/PDMS and the holder were obtained from Supelco Ltd. The fiber was conditioned according to the manufacturer's specification. The samples were taken from the test sample in the test chamber. Sampling time was normally 60 minutes. The test period was 27 days with this fiber. The stabilization period before was 30 days.

After the absorption, the fiber was introduced to the injector for 5 minutes. The run was started immediately after and the detector was on after the elution of air.

GC-MS analysis

The GC-MS equipment was an HP 5890 Gas Chromatograph equipped with a msd 5970 mass selective detector (msd). The analytical column was a ZB-1, length 30 m, inner diameter 0.32 mm, 1.0 μ m phase thickness connected in series with an Hp 5, length 25 m, inner diameter 0.20 mm, 0.11 μ m phase thickness. Total column length 55 m. The injection temperature was set to 270 °C and operated in spitless injection mode for 1 minute, split ratio (1:30). The oven program was 50°C for 1 minute and then the temperature was raised by 10 °C/minute up to 300 °C and kept there for 4 minutes. Total run time 30 minutes.

The scanning range was from 40-450 m/z and the threshold was set to 100. The recorded Total Ion Chromatogram (TIC) is showing the changes in VOC concentrations in the test chamber.

Results

The sample consisted of white paint.

The paint was easy to handle. Did not drip easily and dried quickly. The paint is water based and all tools used are easy to clean with only plain water. The test chamber is shown in picture 1. The sample was painted on wood or board pieces, 0.25 m², and put into a 167 liters test chamber made of glass, shown in picture 1. The chamber was dark for a period of time and the VOC concentrations were measured. Then we introduced light to simulate daylight. We only used normal lights that you can find in any house. When the light was applied the concentration of the VOC compounds in the test chamber were reduced, see pictures 2, 3a, 3b, 6 and 7. It can

be seen from the runs that we performed during a period of 27 days, picture 2, 6 and 7.

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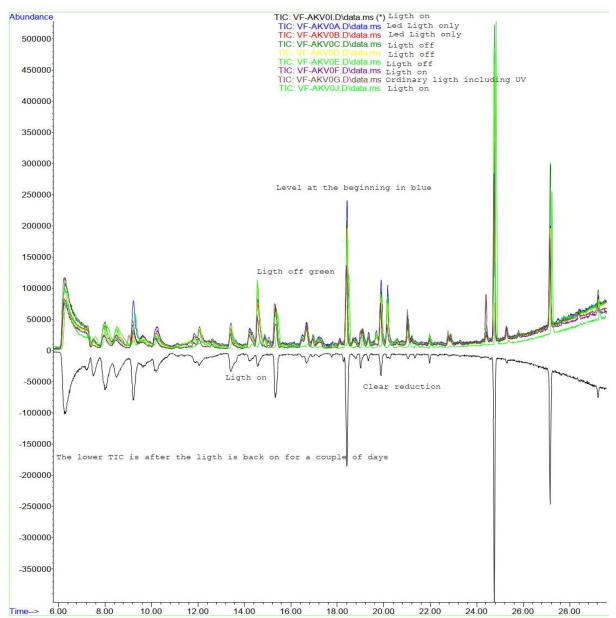
Operator :

Acquired: 17 Oct 2020 14:36 using AcqMethod VOB_1030

Instrument: GC/MS Ins

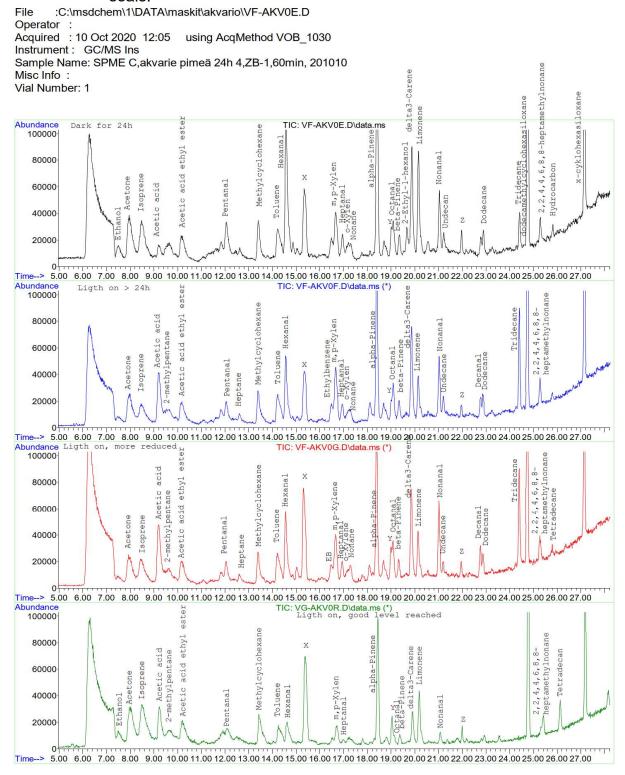
Sample Name: SPME D, akvarie valo>48h 2, ZB-1, >90min, 201016

Misc Info : Vial Number: 1



Picture 2. The comparison between the SPME sampled at different time. Samples A, B during light conditions at starting concentrations. Samples C, D and E no light was on. The rest of the samples was with light on. It can be observed that when the light is missing the concentrations rice, and when the light is switched on, they are again reduced. The test

chamber had a steady emission of a few silicon compounds used in the seals.



Picture 3a. The comparison between the SPME sampled at different times. Sample E at the end of the dark period, sample F when lit for 24 h, sample G after even longer time and sample R, when we begin to reach background levels. The reduction is clearly shown.

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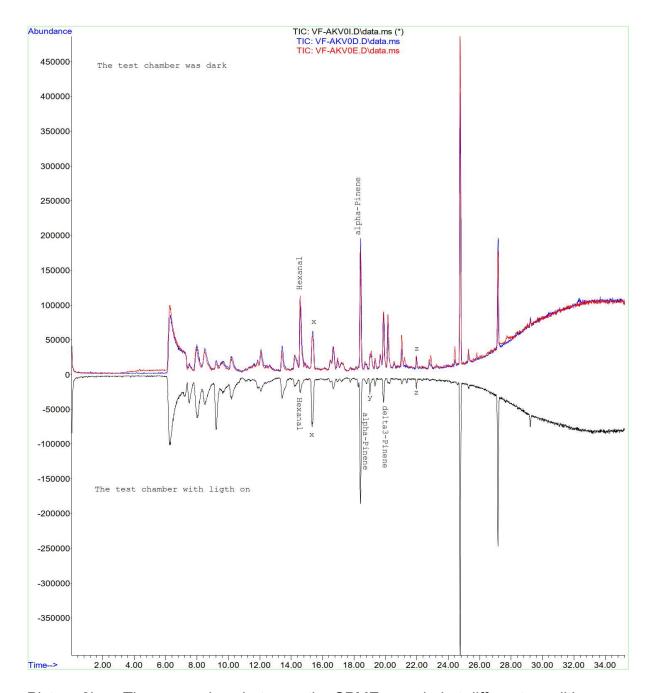
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Instrument: GC/MS Ins

Sample Name: SPME D,akvarie valo>48h 2,ZB-1,>90min, 201016

Misc Info: Vial Number: 1



Picture 3b. The comparison between the SPME sampled at different conditions. Sample D and E at the dark period, sample I light was on. The reduction is clearly shown in this picture.

File :C:\msdchem\1\DATA\tyo0012_1_5 VOC\V4-12-3u.d

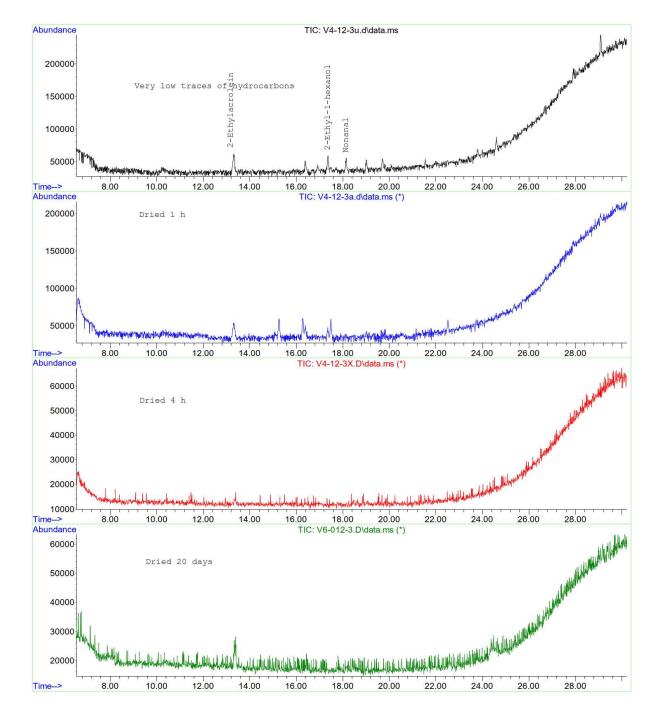
Operator : Erik Sandell

Acquired: 10 Apr 2020 9:49 using AcqMethod VOC_1019

Instrument: GC/MS Ins

Sample Name: SPME B, astia pieni 12-3 0,6g, 10min 200410

Misc Info: Vial Number: 1



Picture 4. From the earlier report the complete TICs of AURO 328 paint, as wet, dried 1 hour, dried 4 hours and dried several weeks. SPME injection after the dried paints was washed with a stream of pure nitrogen gas. This paint had extremely low VOC emissions.

File :C:\msdchem\1\DATA\maskit\akvario\VG-AKV0Y.D

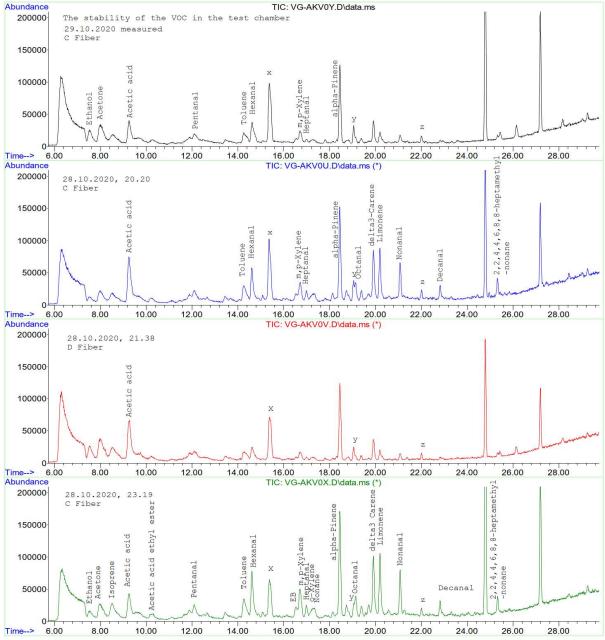
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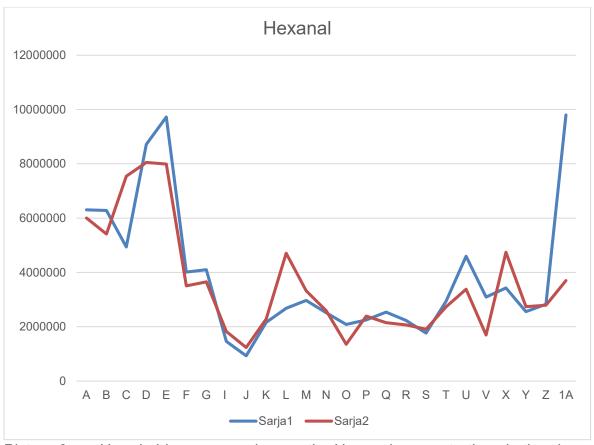
Instrument: GC/MS Ins

Sample Name: SPME C,Akv. 12.22 valot,ZB-1,60min, 201029

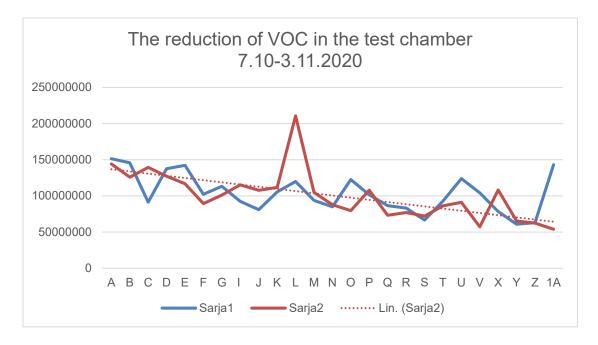
Misc Info : Vial Number: 1



Picture 5. The stability of the measurements with different fibres from same batch. The analysis was performed for 48 hours.



Picture 6. Here in blue we can observe the Hexanal concentrations in the chamber against time presented as sample points A-1A (7.10-3.11.2020). The sample points C, D, E and 1A was under dark conditions. The brown line is raw data.



Picture 8. The VOC content in the test chamber against time exposed to light. The dotted line shows the steady decrease in VOC concentrations. At the end we can observe the increase when the only change was, that the light was switched off.

Table 1. The VOC eluted from Auro paints at 25-30 °C, SPME injection from earlier report.

Sample	Name	Sample amount, wet g	Sample dry matter content, %	Amount µg/sample
12-3	Auro 328, "Ilmaa puhdistava seinämaali"	0.76428	48.4	1.5

Conclusions

The samples consisted of white paint. The sample 012-3 have extremely low VOC emissions, both wet and dry, see table 1. It has also been shown that the paint really cleans the air from VOC compounds, under light conditions, as specified. This is clearly shown in the Pictures 1-7. In the picture 7 we can see the trend line of all VOC present in the test chamber. From picture 6 we can follow the decrease in the concentration of Hexanal in the test chamber air. This paint is very good for the indoor air.

Special analytics expert: Erik Sandell / EKG Consulting Oy/Ltd

Erik Sandell

Signature: