# INFORME No.: 102535

| | |
|---|---|
| **CLIENTE:** | PINTURAS AYELENSES S.L. |
| **PERSONA DE CONTACTO:** | Almudena Espi |
| **DIRECCIÓN:** | P.I. San Jose – C/ de la Pintura 8-10<br>46812 -Ayelo de Malferit – Valencia |
| **OBJETO:** | Emisión de VOCs y clasificación según el esquema AgBB 2021 |
| **MUESTRA ENSAYADA:** | Muestra Ref. «ROKIPLAS 2000» |
| **FECHA DE RECEPCION:** | 27.07.2022 |
| **FECHAS DE ENSAYO:** | 04.08.2022 a 07.10.2022 |
| **FECHA DE EMISIÓN:** | 20.10.2022 |

TECNALIA LAB SERVICES

Firmado digitalmente por: BLANCA ESTHER RUIZ DE GAUNA REY - 16291304J

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## CARACTERISTICAS DE LAS MUESTRAS

Con fecha 27.07.2022 se recibió en Fundación Tecnalia R&I por parte de la empresa ***"PINTURAS AYELENSES S.L."*** una muestra referenciada como[(1)]:

- «ROKIPLAS 2000»

## ENSAYOS SOLICITADOS

Los ensayos solicitados son los siguientes:

- Ensayo de emisión de VOC's (Compuestos orgánicos volátiles) según la norma EN 16516 para establecer una clasificación según los criterios establecidos en el esquema "Health-related Evaluation of Emissions of Volatile Organic Compounds (VVOC, VOC and SVOC) from Building Products" del comité para la evaluación de aspectos de salud de los productos de la construcción (AgBB 2021). Los ensayos se han realizado en el laboratorio acreditado "eco-INSTITUT" cuyo informe original se adjunta como Anexo I.

## ENSAYOS REALIZADOS

El ensayo se ha realizado en una cámara con las siguientes condiciones, según la norma ISO 16000-9:

- Condiciones de la cámara de ensayo
  - Volumen: 0,125$m^3$
  - Temperatura y humedad relativa: 23ºC al 50% HR.
  - Presión: atmosférica
  - Renovación del aire: 0,5 $h^{-1}$
  - Velocidad del aire: 0,3 m/s

La determinación de las emisiones de VOC's se realiza según indica la norma EN 16516 y las analíticas según la norma ISO 16000-6:2006 para VOC's (El límite de detección de las técnicas empleadas es de 1 $\mu g/m^3$) y según la norma ISO 16000-3 para aldehídos y cetonas (siendo el límite de detección para aldehídos y cetonas de 2 $\mu g/m^3$).

## RESULTADOS

Los resultados de Compuestos orgánicos volátiles (VOCs) obtenidos tras 3 días se resumen en las siguientes tablas:

**Tabla I**

| No. | Substancia | Nº CAS. | RT [min] Tiempo de retención | Concentración + (aire cámara ensayo) Substancias ≥ 1 µg/m³ 3 días [µg/m³] | Equivalente tolueno Substancias ≥5 µg/m³ 3 días [µg/m³] | Clasificación CMR | LCI AgBB 2021 [µg/m³] | Valor R |
|---|---|---|---|---|---|---|---|---|
| **4** | **Mono-alcoholes alifáticos (n-, iso-,cyclo-) y dialcoholes** | | | | | | | |
| 4-6 | 1-Butanol | 71-36-3 | 6.06 | 2 | <5 | | 3000 | 0.00 |
| **6** | **Glicoles, Éteres de glicol, Ésteres de glicol** | | | | | | | |
| 6-31 | Éter mono-n-butílico de dipropilenglicol | 29911-28-2 | 18.51 | 72 | 87 | | 250 | 0.29 |
| 6-37 | 2,2,4-Trimetil-1,3-pentanediol diisobutirato (TXIB) | 6846-50-0 | 25.25 | 190 | 210 | | 1300 | 0.15 |
| **7** | **Aldehídos** | | | | | | | |
| 7-7 | Nonanal | 124-19-6 | 15.61 | 4 | <5 | | 900 | 0.00 |
| 7-22 | Formaldehído | 50-00-0 | | 23 | n.d. | Carc. 1B Muta. 2 | 100 | 0.23 |
| **9** | **Ácidos** | | | | | | | |
| 9-1 | Ácido acético | 64-19-7 | 4.77 | 15 | 6 | | 1200 | 0.01 |
| 9-2 | Ácido propiónico | 79-09-4 | 6.11 | 1 | <5 | | 1500 | 0.00 |
| **13** | **Otras sustancias identificadas además de la lista de LCI** | | | | | | | |
| | m/z 43 56 74* | | 6.07 | 1 | <5 | | | |

+ Substancias identificadas y calibradas, substancias calculadas específicamente.

++ Clasificación según el reglamento (EC) N° 1272/2008: Categorías Carc. 1A, 1B y 2, Muta. 1A, 1B y 2, Repr. 1A, 1B y 2, TRGS 905: K1A, K1B, K2, M1A, M1B, M2, R1A, R1B, R2, IARC: Grupo 1, 2A, 2B y 3 DFG (Lista MAK): Categoría III1 a III5

* Substancias no identificadas, calculadas como equivalente de tolueno referenciadas como los fragmentos másicos representativos expresados como relación masa/carga (m/z)

n.d.: no determinado

**Tabla II**

| **Componentes carcinógenos, mutagénicos y tóxicos para la reproducción*** | **Concentración tras 3 días [µg/m³]** | **SERa [µg/m².h]** |
|---|---|---|
| CMR 1: VOC (incl. VVOC y SVOC) clasificados como:<br>- Reglamento (EC) No. 1272/2008 en las siguientes categorías: Carc. 1A y 1B, Muta. 1A y 1B, Repr. 1A y 1B;<br>- TRGS 905: K1A, K1B, M1A, M1B, R1A, R1B;<br>- IARC: Grupo 1 y 2A;<br>- DFG (lista MAK): Categorías III1, III2<br>(Suma) | **<1** | **<0.5** |
| C 1: VOC (incl. VVOC y SVOC) clasificados como:<br>- Reglamento (EC) No. 1272/2008 en las siguientes categorías: Carc. 1A u. 1B;<br>- TRGS 905: K1A, K1B<br>(Suma) | **<1** | **<0.5** |

**Tabla III**

| **TVOC, Compuestos Orgánicos Volátiles Totales** | **Concentración tras 3 días [µg/m³]** | **SERa [µg/m².h]** |
|---|---|---|
| Suma de VOC según DIN EN 16516 | **300** | **150** |
| Suma de VOC según AgBB 2021 | **280** | **140** |
| Suma de VOC según eco-INSTITUT-Label | **290** | **140** |
| Suma de VOC según ISO 16000-6 | **280** | **140** |

**Tabla IV**

| **TSVOC, Compuestos Orgánicos Semivolátiles Totales** | **Concentración tras 3 días [µg/m³]** | **SERa [µg/m².h]** |
|---|---|---|
| Suma de SVOC según DIN EN 16516 | **<5** | **<2.5** |
| Suma de SVOC sin LCI según AgBB 2021 | **<5** | **<2.5** |
| Suma de SVOC sin LCI según eco-INSTITUT-Label | **<1** | **<0.5** |
| Suma de SVOC con LCI según AgBB 2021 | **<5** | **<2.5** |

**Tabla V**

| **TVVOC Compuestos Orgánicos Muy Volátiles Totales** | **Concentración tras 3 días [µg/m³]** | **SERa [µg/m².h]** |
|---|---|---|
| Suma de VVOC según AgBB 2021 | **23** | **12** |
| Suma de VVOC según eco-INSTITUT-Label | **23** | **12** |

***** Excluyendo el formaldehido (Carc. 1B) debido a que se asume un "valor límite práctico" por el que no se prevé un riesgo carcinogénico significativo (ver Federal Institute for Risk Assessment (2006): Toxicological evaluation of formaldehyde and Federal Environment Agency (2016): Reference value for formaldehyde in indoor air). En el caso de una evaluación de emisión toxicológica se necesita un análisis individual de la concentración de formaldehido. En opinión del comité para los valores guía de aire interior (Ausschuss für Innenraumrichtwerte) de la Agencia Federal de Medioambiente, no debería excederse, tampoco para un periodo corto de tiempo, la concentración de 0.1 mg formaldehido/m³ de aire interior, basada en la medida durante media hora (Bundesgesundheitsblatt 2016 · 59: 1040-1044 DOI 10.1007 / s00103 -016-2389-5 © Springer-Verlag Berlin Heidelberg 2016).

**Tabla VI**

| Suma de otros Compuestos Orgánicos Volátiles (VOC) | Concentración tras 3 días [µg/m³] | $SER_a$ [µg/m².h] |
|---|---|---|
| Suma de otros VOC sin LCI según AgBB 2021 (suma) | **<5** | **<2.5** |
| Suma de otros VOC sin LCI según eco-INSTITUT-Label (suma) | **1** | **0.5** |
| CMR 2: VOC (incl. VVOC y SVOC) correspondientes a las categorías:<br>- Reglamento (EC) No. 1272/2008: Categoría Carc. 2, Muta. 2, Repr. 2;<br>- TRGS 905: K2, M2, R2;<br>- IARC: Grupo 2B;<br>- DFG (lista MAK): Categorías III3<br>(Suma) | **23** | **12** |
| Compuestos sensibilizantes categorizados como:<br>- DFG (lista MAK): Categoría IV;<br>- Reglamento (EC) No. 1272/2008: sensibilización cutánea, sensibilización respiratoria<br>- TRGS 907<br>(Suma) | **23** | **12** |
| Terpenos bicíclicos (suma) | **<1** | **<0.5** |
| C9 - C14: Alcanos / Isoalcanos expresado como equivalentes de decano (Suma) | **<1** | **<0.5** |
| C4-C11 aldehídos, acíclicos, alifáticos (Suma) | **4** | **2** |
| C9-C15 Bencenos alquilados (Suma) | **<1** | **<0.5** |
| Cresoles (Suma) | **<1** | **<0.5** |

**Tabla VII**

| Valor de riesgo para evaluación de LCI | Valor R |
|---|---|
| Valor R según eco-INSTITUT-Label | **0.68** |
| Valor R según AgBB 2021 | **0.68** |
| Valor R según regulación belga | **0.68** |
| Valor R según EU-LCI | **0.68** |

Nota:
Los valores de R pueden variar debido a los distintos requisitos de las distintas guías.
Los compuestos carbonílicos de cadena corta (C1-C5) se cuantifican mediante HPLC según DIN ISO 16000-3:2013-01. Por lo tanto, no se dan equivalentes de tolueno para los COV. Estas sustancias se toman en consideración mediante su calibración específica de sustancias a través de la suma de COV según la norma DIN EN 16516:2020-10. Sin embargo, para los COV, la calibración específica de la sustancia se realiza mediante HPLC, mientras que el TVOC se calcula utilizando el equivalente de tolueno determinado mediante Tenax según la norma DIN EN 16516:2020-10.

Los resultados de Compuestos orgánicos volátiles (VOCs) obtenidos tras 28 días se resumen en las siguientes tablas:

**Tabla VIII**

| No. | Substancia | Nº CAS. | RT [min] Tiempo de retención | Concentración + (aire cámara ensayo) Substancias ≥ 1 µg/m³ 28 días [µg/m³] | Equivalente tolueno Substancias ≥5 µg/m³ 28 días [µg/m³] | Clasificación CMR | LCI AgBB 2021 [µg/m³] | Valor R |
|---|---|---|---|---|---|---|---|---|
| **6** | **Glicoles, Éteres de glicol, Ésteres de glicol** | | | | | | | |
| 6-31 | Éter mono-n-butílico de dipropilenglicol | 29911-28-2 | 18.48 | 6 | 6 | | 250 | 0.02 |
| 6-37 | 2,2,4-Trimetil-1,3-pentanediol diisobutirato (TXIB) | 6846-50-0 | 25.26 | 32 | 37 | | 1300 | 0.02 |
| **7** | **Aldehídos** | | | | | | | |
| 7-22 | Formaldehído | 50-00-0 | | 6 | n.d. | Carc. 1B Muta. 2 | 100 | 0.06 |
| **9** | **Ácidos** | | | | | | | |
| 9-1 | Ácido acético | 64-19-7 | 4.7 | 7 | <5 | | 1200 | 0.01 |

+ Substancias identificadas y calibradas, substancias calculadas específicamente.

++ Clasificación según el reglamento (EC) N° 1272/2008: Categorías Carc. 1A, 1B y 2, Muta. 1A, 1B y 2, Repr. 1A, 1B y 2, TRGS 905: K1A, K1B, K2, M1A, M1B, M2, R1A, R1B, R2, IARC: Grupo 1, 2A, 2B y 3 DFG (Lista MAK): Categoría III1 a III5

* Substancias no identificadas, calculadas como equivalente de tolueno referenciadas como los fragmentos másicos representativos expresados como relación masa/carga (m/z)

n.d.: no determinado

**Tabla IX**

| **Componentes carcinógenos, mutagénicos y tóxicos para la reproducción*** | **Concentración tras 28 días [µg/m³]** | **SERa [µg/m².h]** |
|---|---|---|
| CMR 1: VOC (incl. VVOC y SVOC) clasificados como:<br>- Reglamento (EC) No. 1272/2008 en las siguientes categorías: Carc. 1A y 1B, Muta. 1A y 1B, Repr. 1A y 1B;<br>- TRGS 905: K1A, K1B, M1A, M1B, R1A, R1B;<br>- IARC: Grupo 1 y 2A;<br>- DFG (lista MAK): Categorías III1, III2<br>(Suma) | **<1** | **<0.5** |
| C 1: VOC (incl. VVOC y SVOC) clasificados como:<br>- Reglamento (EC) No. 1272/2008 en las siguientes categorías: Carc. 1A u. 1B;<br>- TRGS 905: K1A, K1B<br>(Suma) | **<1** | **<0.5** |

**Tabla X**

| **TVOC, Compuestos Orgánicos Volátiles Totales** | **Concentración tras 28 días [µg/m³]** | **SERa [µg/m².h]** |
|---|---|---|
| Suma de VOC según DIN EN 16516 | **43** | **22** |
| Suma de VOC según AgBB 2021 | **45** | **23** |
| Suma de VOC según eco-INSTITUT-Label | **45** | **23** |
| Suma de VOC según ISO 16000-6 | **45** | **23** |

**Tabla XI**

| **TSVOC, Compuestos Orgánicos Semivolátiles Totales** | **Concentración tras 28 días [µg/m³]** | **SERa [µg/m².h]** |
|---|---|---|
| Suma de SVOC según DIN EN 16516 | **<5** | **<2.5** |
| Suma de SVOC sin LCI según AgBB 2021 | **<5** | **<2.5** |
| Suma de SVOC sin LCI según eco-INSTITUT-Label | **<1** | **<0.5** |
| Suma de SVOC con LCI según AgBB 2021 | **<5** | **<2.5** |

**Tabla XII**

| **TVVOC Compuestos Orgánicos Muy Volátiles Totales** | **Concentración tras 28 días [µg/m³]** | **SERa [µg/m².h]** |
|---|---|---|
| Suma de VVOC según AgBB 2021 | **6** | **3** |
| Suma de VVOC según eco-INSTITUT-Label | **6** | **3** |

***** Excluyendo el formaldehido (Carc. 1B) debido a que se assume un "valor límite práctico" por el que no se prevé un riesgo carcinogénico significativo (ver Federal Institute for Risk Assessment (2006): Toxicological evaluation of formaldehyde and Federal Environment Agency (2016): Reference value for formaldehyde in indoor air). En el caso de una evaluación de emisión toxicológica se necesita un análisis individual de la concentración de formaldehido. En opinión del comité para los valores guía de aire interior (Ausschuss für Innenraumrichtwerte) de la Agencia Federal de Medioambiente, no debería excederse, tampoco para un periodo corto de tiempo, la concentración de 0.1 mg formaldehido/m³ de aire interior, basada en la medida durante media hora (Bundesgesundheitsblatt 2016 · 59:1040-1044 DOI 10.1007 / s00103 -016-2389-5 © Springer-Verlag Berlin Heidelberg 2016).

**Tabla XIII**

| Suma de otros Compuestos Orgánicos Volátiles (VOC) | Concentración tras 28 días [µg/m³] | $SER_a$ [µg/m².h] |
|---|---|---|
| Suma de otros VOC sin LCI según AgBB 2021 (suma) | **<5** | **<2.5** |
| Suma de otros VOC sin LCI según eco-INSTITUT-Label (suma) | **<1** | **<0.5** |
| CMR 2: VOC (incl. VVOC y SVOC) correspondientes a las categorías:<br>- Reglamento (EC) No. 1272/2008: Categoría Carc. 2, Muta. 2, Repr. 2;<br>- TRGS 905: K2, M2, R2;<br>- IARC: Grupo 2B;<br>- DFG (lista MAK): Categorías III3<br>(Suma) | **6** | **3** |
| Compuestos sensibilizantes categorizados como:<br>- DFG (lista MAK): Categoría IV;<br>- Reglamento (EC) No. 1272/2008: sensibilización cutánea, sensibilización respiratoria<br>- TRGS 907<br>(Suma) | **6** | **3** |
| Terpenos bicíclicos (suma | **<1** | **<0.5** |
| C9 - C14: Alcanos / Isoalcanos expresado como equivalentes de decano (Suma) | **<1** | **<0.5** |
| C4-C11 aldehídos, acíclicos, alifáticos (Suma) | **<3** | **<1.3** |
| C9-C15 Bencenos alquilados (Suma) | **<1** | **<0.5** |
| Cresoles (Suma) | **<1** | **<0.5** |

**Tabla XIV**

| Valor de riesgo para evaluación de LCI | Valor R |
|---|---|
| Valor R según eco-INSTITUT-Label | **0.11** |
| Valor R según AgBB 2021 | **0.11** |
| Valor R según regulación belga | **0.11** |
| Valor R según EU-LCI | **0.11** |

Nota:
Los valores de R pueden variar debido a los distintos requisitos de las distintas guías.
Los compuestos carbonílicos de cadena corta (C1-C5) se cuantifican mediante HPLC según DIN ISO 16000-3:2013-01. Por lo tanto, no se dan equivalentes de tolueno para los COV. Estas sustancias se toman en consideración mediante su calibración específica de sustancias a través de la suma de COV según la norma DIN EN 16516:2020-10. Sin embargo, para los COV, la calibración específica de la sustancia se realiza mediante HPLC, mientras que el TVOC se calcula utilizando el equivalente de tolueno determinado mediante Tenax según la norma DIN EN 16516:2020-10.

Evaluación de resultados:

El producto denominado «ROKIPLAS 2000» se ha ensayado y se evalúa en base a los criterios de ensayo del esquema “Health-related Evaluation of Emissions of Volatile Organic Compounds (VVOC, VOC and SVOC) from Building Products” del comité para la evaluación de aspectos de salud de los productos de la construcción (AgBB 2021):

**Tabla XV. Evaluación de resultados**

| Parámetro de ensayo | Resultado | Requisito | Cumplimiento (Si/No) |
|---|---|---|---|
| Tiempo de medida: 3 días después de introducir el producto en la cámara | | | |
| Suma VOC (C6-C16)(2) | 0.28 mg/m$^3$ | ≤10 mg/m$^3$ | Si |
| Suma substancias carcinógenas (EU cat. 1A y 1B) | <0.001 mg/m$^3$ | ≤0.01 mg/m$^3$ | Si |
| Tiempo de medida: 28 días después de introducir el producto en la cámara | | | |
| Suma VOC (C6-C16) incluyendo SVOCs con LCI(2) | 0.045 mg/m$^3$ | ≤1 mg/m$^3$ | Si |
| Suma SVOC sin LCI (C16-C22)(2) | <0.005 mg/m$^3$ | ≤0.1 mg/m$^3$ | Si |
| Valor R-Wert (adimensional) | 0.11 | ≤1 | Si |
| Suma de VOC sin LCI | <0.005 mg/m$^3$ | ≤0.1 mg/m$^3$ | Si |
| Suma substancias carcinógenas (EU cat. 1A y 1B) | <0.001 mg/m$^3$ | ≤0.001 mg/m$^3$ | Si |

(2) Para la suma de VOC (C6-C16) y SVOCs (C16-C22) solo se consideran substancias ≥5μg/m$^3$

# ANEXO

eco-INSTITUT Germany GmbH
Laborprüfung
Laboratory testing

Tecnalia Research & Innovation
Mikeletegi Pasealekua, 2
20009 Donostia - San Sebastian
Spain

# Test Report No. 57625-A001-AgBB-L

| | |
|---|---|
| **Test objective:** | **Evaluation according to AgBB-scheme 2021** |
| **Article designation according to order:** | **ROKIPLAS 2000** |
| **Sample/batch according to order:** | **no information** |
| Sampling by: | PINTURAS AYALENSES, S.L., P.I. San José. s/l, 46812 Ayelo de Malferit, Valencia, España |
| Date of sampling: | 27/07/2022 |
| Location of sampling: | PINTURAS AYALENSES, S.L., P.I. San José. s/l, 46812 Ayelo de Malferit, Valencia, España |
| Date of production: | no information |
| Date of report: | 07/10/2022 |
| Number of pages of report: | 19 |
| Testing laboratory: | eco-INSTITUT Germany GmbH, Köln |
| Test objective fulfilled: | ✓ |
| Note: | The test results in the report refer exclusively to the test sample submitted by the manufacturer. The report is not permitted to be used in product and company advertising. The report may be published in full as technical documentation on the Internet with the written consent of eco-INSTITUT Germany GmbH. eco-INSTITUT Germany GmbH has recommended that the manufacturer repeats the test after 3 years at the latest. More information at www.eco-institut.de/en/advertising |

# Content

# Sample View

| Internal sample number (assigned by the laboratory) | Article designation according to order | Sample/batch number according to order | Receipt of sample | Condition upon delivery | Type of sample |
|---|---|---|---|---|---|
| 57625-A001 | ROKIPLAS 2000 | no information | 04/08/2022 | without objection | For the painting of all types of building surfaces such as facades, party walls, courtyards, etc., both exterior and interior |

57625-A001

# Statement of conformity with AgBB 2021

The sample with the internal sample number 57625-A001 has been tested on behalf of **Tecnalia Research & Innovation**. The article description according to the order is **ROKIPLAS 2000.**

This evaluation is based on the test criteria of the Scheme "Health-related Evaluation of Emissions of Volatile Organic Compounds (VVOC, VOC and SVOC) from Building Products" of the Committee for Health-Related Evaluation of Building Products (AgBB 2021).

The results documented in the test report were evaluated as follows.[1]

| Test parameter | Result | Requirement | Requirement hold [yes/no] |
|---|---|---|---|
| **Emission analysis** | | | |
| **Measurement time: 3 days after test chamber loading** | | | |
| Sum VOC (C6-C16) [1)] | 0.28 mg/m³ | ≤ 10 mg/m³ | yes |
| Sum carcinogenic substances, cat. 1A and 1B acc. to Regulation (EC) No. 1272/2008 (and TRGS 905) | < 0.001 mg/m³ | ≤ 0.01 mg/m³ | yes |
| **Measurement time: 28 days after test chamber loading** | | | |
| Sum VOC (C6-C16) including SVOC with LCI [1)] | 0.045 mg/m³ | ≤ 1 mg/m³ | yes |
| Sum SVOC without LCI ($C_{16}$-$C_{22}$) [1)] | < 0.005 mg/m³ | ≤ 0.1 mg/m³ | yes |
| R-value (dimensionless) | 0.11 | ≤ 1 | yes |
| Sum VOC without LCI | < 0.005 mg/m³ | ≤ 0.1 mg/m³ | yes |
| Sum carcinogenic substances, cat. 1A and 1B acc. to Regulation (EC) No. 1272/2008 (and TRGS 905) | < 0.001 mg/m³ | ≤ 0.001 mg/m³ | yes |

1) For sum VOC ($C_6$-$C_{16}$) and sum SVOC ($C_{16}$-$C_{22}$) only substances ≥ 5 µg/m³ are considered.

2) Requirement hold due to the rounding specifications to one significant digit.

[1] If a measurement result that slightly exceeds the specification is assessed as "not fulfilled", this is based on the agreement of the "shared risk of measurement uncertainty (shared risk approach)". According to this, the probability that the statement is correct is ≥ 50%. Similarly, a result slightly below the specification value also only has a probability of ≥ 50 % of being compliant. I.e., the risk of making a false negative statement regarding the fulfilment of the specification is just as high as the risk of making a false positive statement (more information at https://www.eco-institut.de/en/2019/07/measurement_uncertainty/).

# Summary statement of conformity with AgBB 2021

The sample with the internal sample number 57625-A001, article description according to order: **ROKIPLAS 2000**, meets the emission requirements of the AgBB scheme.

Cologne, 07/10/2022

Marc-Anton Dobaj, M.Sc. Crystalline Materials
(Project management)

# Laboratory report

## 1 Emission analysis

### Test method

| | |
|---|---|
| DIN EN 16516:2020-10 | Testing and evaluation of the release of dangerous substances; determination of emissions into indoor air |

### A001, Preparation of test sample

| | |
|---|---|
| Date: | 26/08/2022 |
| Sample preparation: | Application on glass with a brush; application quantity 152 g/m²; drying / pre-conditioning outside of the test chamber 72 hours |
| Masking of backside: | not applicable |
| Masking of edges: | no |
| Relationship of unmasked edges to surface: | not applicable |
| Loading: | related to area |
| Dimensions: | 2 x [25 cm x 20 cm] with each 7,6 g |

### A001, Test chamber conditions according to DIN ISO 16000-9:2008-04

| | |
|---|---|
| Chamber volume: | 0.100 m³ |
| Temperature: | 23 °C ± 1 °C |
| Relative humidity: | 50 % ± 1 % |
| Air pressure: | normal |
| Air: | cleaned |
| Air change rate: | 0.5 $h^{-1}$ |
| Air velocity: | 0.3 m/s |
| Loading: | 1 m²/m³ |
| Specific air flow rate: | 0.5 m³/(m² · h) |
| Starting time of the test (t0): | 29/08/2022 |
| Air sampling: | 3 days after test chamber loading<br>28 days after test chamber loading |

### Analytics

| | |
|---|---|
| Aldehydes and Ketones | DIN ISO 16000-3:2013-01 |
| Limit of quantification: | 2 µg/m³ |
| Volatile Organic Compounds | DIN ISO 16000-6:2022-03 |
| Limit of quantification: | 1 µg/m³ (1,4-Cyclohexanedimethanol, Diethylene glycol, 1,4-Butanediol: 5 µg/m³) |
| Note for analysis: | not specified |

## 1.1 Sample A001, Volatile Organic Compounds after 3 days

**Test objective:**
Volatile Organic Compounds (VOC), test chamber, air sampling 3 days after test chamber loading

**Test result:**

| | |
|---|---|
| Internal sample number: | 57625-A001 |

| No. | Substance | CAS No. | RT [min] | Concentration+ calib. substances ≥ 1 µg/m³ uncalib. substances ≥ 1 µg/m³ DNPH ≥ 3 µg/m³ [µg/m³] | Toluene-equivalent substances ≥ 5 µg/m³ [µg/m³] | CMR Classification++ | LCI AgBB 2021 [µg/m³] | R-value |
|---|---|---|---|---|---|---|---|---|
| **4** | **Aliphatic mono alcohols (n-, iso-, cyclo-) and dialcohols** | | | | | | | |
| 4-6 | 1-Butanol | 71-36-3 | 6.06 | 2 | < 5 | | 3000 | 0.00 |
| **6** | **Glycols, Glycol ethers, Glycol esters** | | | | | | | |
| 6-31 | Dipropylene glycol mono-n-butyl ether | 29911-28-2 | 18.51 | 72 | 87 | | 250 | 0.29 |
| 6-37 | 2,2,4-Trimethyl-1,3-pentanediol diisobutyrate (TXIB) | 6846-50-0 | 25.25 | 190 | 210 | | 1300 | 0.15 |
| **7** | **Aldehydes** | | | | | | | |
| 7-7 | Nonanal | 124-19-6 | 15.61 | 4 | < 5 | | 900 | 0.00 |
| 7-22 | Formaldehyde | 50-00-0 | | 23 | n. d. | Carc. 1B Muta. 2 | 100 | 0.23 |
| **9** | **Acids** | | | | | | | |
| 9-1 | Acetic acid | 64-19-7 | 4.77 | 15 | 6 | | 1200 | 0.01 |
| 9-2 | Propionic acid | 79-09-4 | 6.11 | 1 | < 5 | | 1500 | 0.00 |
| **13** | **Other identified substances in addition to LCI list** | | | | | | | |
| | m/z 43 56 74* | | 6.07 | 1 | < 5 | | | |

+ identified and calibrated substances, substance specific calculated
++ Classification according to Regulation (EG) N° 1272/2008: Categories Carc. 1A, 1B and 2, Muta. 1A, 1B and 2, Repr. 1A, 1B and 2, TRGS 905: K1A, K1B, K2, M1A, M1B, M2, R1A, R1B, R2; IARC: Group 1, 2A, 2B and 3, DFG MAK-list: Categorie III1 to III5
* unidentified substances, calculated as toluene equivalent reported with significant mass fragments as mass-to-charge ratio (m/z)
n. d.: not determined

| Carcinogenic, mutagenic and reproductive toxic components* | Concentration after 3 days [µg/m³] | SERa [µg/(m² • h)] |
|---|---|---|
| CMR 1: VOC (incl. VVOC and SVOC) with the following categorisations:<br>Regulation (EC) No. 1272/2008: Category Carc. 1A and 1B, Muta. 1A and 1B, Repr. 1A and 1B;<br>TRGS 905: K1A, K1B, M1A, M1B, R1A, R1B;<br>IARC: Group 1 and 2A;<br>DFG (MAK list): Categories III1, III2<br>(sum) | < 1 | < 0.5 |
| C 1: VOC (incl. VVOC and SVOC) with the following categorisations:<br>Regulation (EG) Nr. 1272/2008: Category Carc. 1A u. 1B;<br>TRGS 905: K1A, K1B<br>(sum) | < 1 | < 0.5 |

| TVOC, Total volatile organic compounds | Concentration after 3 days [µg/m³] | SERa [µg/(m² • h)] |
|---|---|---|
| Sum of VOC according to DIN EN 16516 | 300 | 150 |
| Sum of VOC according to AgBB 2021 | 280 | 140 |
| Sum of VOC according to eco-INSTITUT-Label | 290 | 140 |
| Sum of VOC according to ISO 16000-6 | 280 | 140 |

| TSVOC, Total semi volatile organic compounds | Concentration after 3 days [µg/m³] | SERa [µg/(m² • h)] |
|---|---|---|
| Sum of SVOC according to DIN EN 16516 | < 5 | < 2.5 |
| Sum of SVOC without LCI according to AgBB 2021 | < 5 | < 2.5 |
| Sum of SVOC without LCI according to eco-INSTITUT-Label | < 1 | < 0.5 |
| Sum of SVOC with LCI according to AgBB 2021 | < 5 | < 2.5 |

| TVVOC, Total very volatile organic compounds | Concentration after 3 days [µg/m³] | SERa [µg/(m² • h)] |
|---|---|---|
| Sum of VVOC according to AgBB 2021 | 23 | 12 |
| Sum of VVOC according to eco-INSTITUT-Label | 23 | 12 |

*Excluding formaldehyde and acetaldehyde (Carc. 1B) due to an assumed "practical threshold" under which a significant carcinogenic risk is no longer to be expected (see Federal Institute for Risk Assessment (2006): Toxicological evaluation of formaldehyde and Federal Environment Agency (2016): Reference value for formaldehyde in indoor air and protocol of the 11th meeting of 'Ausschusses für Innenraumrichtwerte' (AIR), 11/2020). In the case of a toxicological emission assessment, a single-substance analysis of the concentrations is necessary.
In the opinion of the committee for Indoor Air Guide Values (Ausschuss für Innenraumrichtwerte) of the Federal Environment Agency, the concentration of 0.1 mg formaldehyde/m³ indoor air, based on a measurement period of half an hour, should not be exceeded, also for a short time (Bundesgesundheitsblatt 2016 · 59: 1040-1044 DOI 10.1007 / s00103 -016-2389-5 © Springer-Verlag Berlin Heidelberg 2016).

| Other sums of VOC | Concentration after 3 days [µg/m³] | SERa [µg/(m² • h)] |
|---|---|---|
| VOC without LCI according to AgBB 2021 (sum) | < 5 | < 2.5 |
| VOC without LCI according to eco-INSTITUT-Label (sum) | 1 | 0.5 |
| CMR 2: VOC (incl. VVOC and SVOC) with the following categorisations:<br>Regulation (EC) No. 1272/2008: Category Carc. 2, Muta. 2, Repr. 2;<br>TRGS 905: K2, M2, R2;<br>IARC: Group 2B;<br>DFG (MAK list): Category III3<br>(sum) | 23 | 12 |
| Sensitising compounds with the following categorisations:<br>DFG (MAK list): Category IV;<br>Regulation (EC) No. 1272/2008: skin sensitising, respiratory sensitising;<br>TRGS 907<br>(sum) | 23 | 12 |
| Bicyclic Terpenes (sum) | < 1 | < 0.5 |
| C9 - C14 Alkanes / Isoalkanes as dekane-equivalent (sum) | < 1 | < 0.5 |
| C4 - C11 Aldehydes, acyclic, aliphatic (sum) | 4 | 2 |
| C9 - C15 Alkylated benzenes (sum) | < 1 | < 0.5 |
| Cresols (sum) | < 1 | < 0.5 |

| Risk value for assessment of LCI | R-value |
|---|---|
| R-value according to eco-INSTITUT-Label | 0.68 |
| R-value according to AgBB 2021 | 0.68 |
| R-value according to Belgian regulation | 0.68 |
| R-value according to EU-LCI | 0.68 |

Note:

Due to different requirements in the respective guidelines, the calculation of TVOC, TVVOC, TSVOC and R-value may result in different values.

Short-chain carbonyl compounds (C1-C5) are quantified via HPLC acc. to DIN ISO 16000-3:2013-01. Therefore, no toluene equivalents are given for VVOC. These substances are taken into concern by means of their substance specific calibration via the sum of VVOC acc. to DIN EN 16516:2020-10. For VOC however, the substance specific calibration takes place via HPLC whereas the TVOC is calculated using the toluene equivalent determined via Tenax acc. to DIN EN 16516:2020-10.

## 1.2 Sample A001, Volatile Organic Compounds after 28 days

**Test objective:**
Volatile Organic Compounds (VOC), test chamber, air sampling 28 days after test chamber loading

**Test result:**

| Internal sample number: | 57625-A001 |
|---|---|

| No. | Substance | CAS No. | RT [min] | Concentration+ calib. substances ≥ 1 µg/m³ uncalib. substances ≥ 1 µg/m³ DNPH ≥ 3 µg/m³ [µg/m³] | Toluene-equivalent substances ≥ 5 µg/m³ [µg/m³] | CMR Classifi-cation++ | LCI AgBB 2021 [µg/m³] | R-value |
|---|---|---|---|---|---|---|---|---|
| **6** | **Glycols, Glycol ethers, Glycol esters** | | | | | | | |
| 6-31 | Dipropylene glycol mono-n-butyl ether | 29911-28-2 | 18.48 | 6 | 6 | | 250 | 0.02 |
| 6-37 | 2,2,4-Trimethyl-1,3-pentanediol diisobutyrate (TXIB) | 6846-50-0 | 25.26 | 32 | 37 | | 1300 | 0.02 |
| **7** | **Aldehydes** | | | | | | | |
| 7-22 | Formaldehyde | 50-00-0 | | 6 | n. d. | Carc. 1B Muta. 2 | 100 | 0.06 |
| **9** | **Acids** | | | | | | | |
| 9-1 | Acetic acid | 64-19-7 | 4.7 | 7 | < 5 | | 1200 | 0.01 |

+ identified and calibrated substances, substance specific calculated
++ Classification according to Regulation (EG) N° 1272/2008: Categories Carc. 1A, 1B and 2, Muta. 1A, 1B and 2, Repr. 1A, 1B and 2, TRGS 905: K1A, K1B, K2, M1A, M1B, M2, R1A, R1B, R2; IARC: Group 1, 2A, 2B and 3, DFG MAK-list: Categorie III1 to III5
* unidentified substances, calculated as toluene equivalent reported with significant mass fragments as mass-to-charge ratio (m/z)
n. d.: not determined

| Carcinogenic, mutagenic and reproductive toxic components* | Concentration after 28 days [µg/m³] | SERa [µg/(m² • h)] |
|---|---|---|
| CMR 1: VOC (incl. VVOC and SVOC) with the following categorisations:<br>Regulation (EC) No. 1272/2008: Category Carc. 1A and 1B, Muta. 1A and 1B, Repr. 1A and 1B;<br>TRGS 905: K1A, K1B, M1A, M1B, R1A, R1B;<br>IARC: Group 1 and 2A;<br>DFG (MAK list): Categories III1, III2<br>(sum) | < 1 | < 0.5 |
| C 1: VOC (incl. VVOC and SVOC) with the following categorisations:<br>Regulation (EG) Nr. 1272/2008: Category Carc. 1A u. 1B;<br>TRGS 905: K1A, K1B<br>(sum) | < 1 | < 0.5 |

| TVOC, Total volatile organic compounds | Concentration after 28 days [µg/m³] | SERa [µg/(m² • h)] |
|---|---|---|
| Sum of VOC according to DIN EN 16516 | 43 | 22 |
| Sum of VOC according to AgBB 2021 | 45 | 23 |
| Sum of VOC according to eco-INSTITUT-Label | 45 | 23 |
| Sum of VOC according to ISO 16000-6 | 45 | 23 |

| TSVOC, Total semi volatile organic compounds | Concentration after 28 days [µg/m³] | SERa [µg/(m² • h)] |
|---|---|---|
| Sum of SVOC according to DIN EN 16516 | < 5 | < 2.5 |
| Sum of SVOC without LCI according to AgBB 2021 | < 5 | < 2.5 |
| Sum of SVOC without LCI according to eco-INSTITUT-Label | < 1 | < 0.5 |
| Sum of SVOC with LCI according to AgBB 2021 | < 5 | < 2.5 |

| TVVOC, Total very volatile organic compounds | Concentration after 28 days [µg/m³] | SERa [µg/(m² • h)] |
|---|---|---|
| Sum of VVOC according to AgBB 2021 | 6 | 3 |
| Sum of VVOC according to eco-INSTITUT-Label | 6 | 3 |

*Excluding formaldehyde and acetaldehyde (Carc. 1B) due to an assumed "practical threshold" under which a significant carcinogenic risk is no longer to be expected (see Federal Institute for Risk Assessment (2006): Toxicological evaluation of formaldehyde and Federal Environment Agency (2016): Reference value for formaldehyde in indoor air and protocol of the 11th meeting of 'Ausschusses für Innenraumrichtwerte' (AIR), 11/2020). In the case of a toxicological emission assessment, a single-substance analysis of the concentrations is necessary.
In the opinion of the committee for Indoor Air Guide Values (Ausschuss für Innenraumrichtwerte) of the Federal Environment Agency, the concentration of 0.1 mg formaldehyde/m³ indoor air, based on a measurement period of half an hour, should not be exceeded, also for a short time (Bundesgesundheitsblatt 2016 · 59: 1040-1044 DOI 10.1007 / s00103 -016-2389-5 © Springer-Verlag Berlin Heidelberg 2016).

| Other sums of VOC | Concentration after 28 days [µg/m³] | SERa [µg/(m² • h)] |
|---|---|---|
| VOC without LCI according to AgBB 2021 (sum) | < 5 | < 2.5 |
| VOC without LCI according to eco-INSTITUT-Label (sum) | < 1 | < 0.5 |
| CMR 2: VOC (incl. VVOC and SVOC) with the following categorisations:<br>Regulation (EC) No. 1272/2008: Category Carc. 2, Muta. 2, Repr. 2;<br>TRGS 905: K2, M2, R2;<br>IARC: Group 2B;<br>DFG (MAK list): Category III3<br>(sum) | 6 | 3 |
| Sensitising compounds with the following categorisations:<br>DFG (MAK list): Category IV;<br>Regulation (EC) No. 1272/2008: skin sensitising, respiratory sensitising;<br>TRGS 907<br>(sum) | 6 | 3 |
| Bicyclic Terpenes (sum) | < 1 | < 0.5 |
| C9 - C14 Alkanes / Isoalkanes as dekane-equivalent (sum) | < 1 | < 0.5 |
| C4 - C11 Aldehydes, acyclic, aliphatic (sum) | < 3 | < 1.3 |
| C9 - C15 Alkylated benzenes (sum) | < 1 | < 0.5 |
| Cresols (sum) | < 1 | < 0.5 |

| Risk value for assessment of LCI | R-value |
|---|---|
| R-value according to eco-INSTITUT-Label | 0.11 |
| R-value according to AgBB 2021 | 0.11 |
| R-value according to Belgian regulation | 0.11 |
| R-value according to EU-LCI | 0.11 |

Note:

Due to different requirements in the respective guidelines, the calculation of TVOC, TVVOC, TSVOC and R-value may result in different values.

Short-chain carbonyl compounds (C1-C5) are quantified via HPLC acc. to DIN ISO 16000-3:2013-01. Therefore, no toluene equivalents are given for VVOC. These substances are taken into concern by means of their substance specific calibration via the sum of VVOC acc. to DIN EN 16516:2020-10. For VOC however, the substance specific calibration takes place via HPLC whereas the TVOC is calculated using the toluene equivalent determined via Tenax acc. to DIN EN 16516:2020-10.

Cologne, 07/10/2022

Michael Stein, Dipl.-Chem.
(Laboratory Manager)

# Appendix

## Sampling sheet

Produktprüfung Product testing
Zertifizierung Certification
Beratung Consulting

**57625-001**

eco INSTITUT

### Sampling Sheet*

| | | | |
|---|---|---|---|
| **Testing laboratory** | eco-INSTITUT Germany GmbH<br>Schanzenstr. 6-20, D-51063 Cologne<br>Germany<br>Tel. +49 (0)221 - 931245-0<br>Fax +49 (0)221 - 931245-33 | **Sampler** (Name, Company, Phone number) | Same as manufacturer. |
| **Name of manufacturer / distributor at place of sampling** (Address / Stamp) | PINTURAS AYALENSES, S.L.<br>P.I. San José, s/l<br>46812 AYELO DE MALFERIT,<br>VALENCIA, ESPAÑA | **Customer/ Invoice recipient** (if different from manufacturer) | TECNALIA<br>CIF: G48975767<br>Parque Científico y Tecnológico de<br>Bizkaia C\Geldo, Edificio 700<br>E-48160 Derio (Bizkaia) Spain |
| **Product name** | ROKIPLAS 2000 | **Product type** (e.g. parquet, floor covering) | For the painting of all types of building surfaces such as facades, party walls, courtyards, etc., both exterior and interior. |
| **Model / programme / series** | -- | **Batch** | -- |
| **Article number** | -- | **Production date of batch** | -- |
| **Samples are taken from** | ☐ current production<br>☒ storage | **Sampling date** | 27.07.22 |
| | | **Sampling time** | |
| **Storage location before sampling** | ☐ in production<br>☒ storage<br>☐ other | **Storage conditions before sampling** | ☐ open<br>☒ packaged |
| | Storage location:<br>Manufacturer location | | Packaging material:<br>Plastic |
| **Special features** (possible negative effects through emissions at place of sampling (e.g. benzine, exhaust fumes), unclarities, questions etc.) | Application rate: 151,97gr/m2 | | |

**Validation**

Hereby the signer affirms the accuracy of the above-mentioned statements. The sample was chosen, sampled and packaged according to the sampling guidelines.

Date: 03.08.22 Signature:
(Company stamp)

tecnalia
MEMBER OF BASQUE RESEARCH & TECHNOLOGY ALLIANCE

* Please take one sampling sheet for each sample! The sampling instruction must be strictly maintained.

| | |
|---|---|
| **Order** (Please insert quote number, or - if not available, please enter the desired analysis) | Reference from Tecnalia: 102535<br>Test required: 04724 + 02181 + 02193<br>official order: SPC22-07673 / PC22-07016 |

DAkkS Deutsche Akkreditierungsstelle D-PL-14117-01-00

# List of calibrated Volatile Organic Compounds (VOC)

**Aromatic hydrocarbons (31)**
Benzene[4]
1,2,3-Trimethylbenzene
1,2,4-Trimethylbenzene
1,3,5-Trimethylbenzene
1-Isopropyl-2-methylbenzene
1-Isopropyl-4-methylbenzene
1,2,4,5-Tetramethylbenzene
Ethylbenzene
n-Propylbenzene
Isopropylbenzene (Cumene)
1,3-Diisopropylbenzene
1,4-Diisopropylbenzene
n-Butylbenzene
1-Propenylbenzene (beta-Methylstyrene)
Toluene
2-Ethyltoluene
Vinyltoluene
o-Xylene
m-/p-Xylene
Styrene
Phenylacetylene
2-Phenylpropene (alpha-Methylstyrene)
4-Phenylcyclohexene
1-Phenyloctane
1-Phenyldecane[2]
1-Phenylundecane[2]
Indene
Naphthalene
1-Methylnaphthalene
2-Methylnaphthalene
1,4-Dimethylnaphthalene

**Aliphatic hydrocarbons (23)**
2-Methylpentane[1]
3-Methylpentane[1]
Methylcyclopentane
n-Hexane
Cyclohexane
Methylcyclohexane
1,4-Dimethylcyclohexane
n-Heptane
2,2,4,6,6-Pentamethylheptane
n-Octane
n-Nonane
n-Decane
n-Undecane
n-Dodecane
n-Tridecane
n-Tetradecane
n-Pentadecane
n-Hexadecane
Decahydronaphthalene
1-Octene
1-Decene
1-Dodecene
4-Vinylcyclohexene

**Terpenes (12)**
delta-3-Carene
alpha-Pinene
beta-Pinene
alpha-Terpinene
Longipinene
Limonene
Longifolene
Isolongifolene
beta-Caryophyllene
alpha-Phellandrene
Myrcene
Camphene

**Aliphatic alcohols and ether (18)**
Ethanol[1]
1-Propanol[1]
2-Propanol[1]
2-Methyl-1-propanol
1-Butanol
tert-Butanol
1-Pentanol
1-Hexanol
Cyclohexanol
2-Ethyl-1-hexanol
1-Heptanol
1-Octanol
1-Nonanol
1-Decanol
1,4-Cyclohexandimethanol
4-Hydroxy-4-methyl-pentan-2-one (Diacetone alcohol)
Methyl-tert-butyl ether (MTBE)[1]
Tetrahydrofuran (THF)

**Aromatic alcohols (phenoles) (8)**
Furfuryl alcohol
Benzyl alcohol
Phenol
2-Phenylphenol (oPP)
BHT (2,6-Di-tert-butyl-4-methylphenol)
o-Cresol
m-/p-Cresol
4-Chloro-3-methylphenol (Chlorocresol)

**Glycols, Glycol ether, Glycol ester (49)**
Ethyleneglycol (Ethan-1,2-diol)
Propylenglycol (Propane-1,2-diol)
Diethylene glycol
Dipropylene glycol
Neopentyl glycol
Hexyleneglycol
Ethyldiglycol
Ethylene glycol monobutyl ether
Diethylene glycol methyl ether
Diethylene glycol monobutyl ether
Diethylene glycol phenyl ether
Dipropylene glycol-dimetyl ether
Dipropylene glycol mono-n-butyl ether
Dipropylene glycol mono-tert-butyl ether
Dipropylene glycol monomethyl ether
Dipropylene glycol mono-n-propyl ether
Tripropylene glycol monomethyl ether
Triethylene glycol dimethyl ether
1,2-Propylene glycol dimethyl ether
1,2-Propylene glycol-n-propyl ether
1,2-Propylene glycol-n-butyl ether
Butyl glycolate
2-Methoxyethanol
2-Ethoxyethanol
2-Methylethoxyethanol
2-Propoxyethanol
2-Hexoxyethanol
2-(2-Hexoxyethoxy)ethanol
2-Phenoxyethanol
1-Methoxy-2-propanol
2-Methoxy-1-propanol
1-Ethoxy-2-propanol
1-tert-Butoxy-2-propanol
3-Methoxy-1-butanol
1,4-Butanediol
1,2-Dimethoxyethane
1,2-Diethoxyethane
1-Methoxy-2-(2-methoxy-ethoxy)ethane
Ethylene carbonate
Propylene carbonate
2-Methoxy-1-propyl acetate
Diethylene glycol monomethyl ether acetate
2-Methoxyethyl acetate
2-Ethoxyethyl acetate
2-Butoxy ethyl acetate
Dipropylene glycol monomethyl ether acetate
Propylene glycol diacetate
Texanol
TXIB (Texanol isobutyrate)

**Aldehydes (26)**
Formaldehyde[1,3,4]
Acetaldehyde[1,3,4]
Propanal[1,3]
Butanal[1,3]
3-Methyl-1-butanal
Pentanal
Hexanal
2-Ethylhexanal
Heptanal
Octanal
Nonanal
Decanal
Propenal (Acrolein)[1,3]
Isobutenal (Methacrolein)[3]
2-Butenal[3]
2-Pentenal[3]
2-Hexenal
2-Heptenal
2-Octenal

2-Nonenal
2-Decenal
2-Undecenal
Ethanedial (Glyoxal)[1,3]
Glutaraldehyde
Furfural
Benzaldehyde

**Ketones (14)**
Acetone[1,3]
1-Hydroxyacetone
Ethylmethylketone[3]
Methylisobutylketone
3-Methyl-2-butanone
Cyclopentanone
2-Methylcyclopentanone
Cyclohexanone
2-Methylcyclohexanone
2-Hexanone
2-Heptanone
Acetophenone
Isophorone
Benzophenone[2]

**Acids (11)**
Acetic acid
Propionic acid
Pivalic acid
Butyric acid
Isobutyric acid
n-Valeric acid
n-Caproic acid
2-Ethylhexanoic acid
n-Heptanoic acid
n-Octanoic acid
Neodecanoic acid

**Esters and Lactones (31)**
Methyl acetate[1]
Ethyl acetate[1]
Vinyl acetate[1]
Propyl acetate
Isopropyl acetate
2-Methoxy-1-methylethyl acetate
n-Butyl acetate
Isobutylacetate
2-Ethylhexyl acetate
n-Butyl formate
Methyl acrylate
Methyl methacrylate
Butyl methacrylate
Ethyl acrylate
n-Butyl acrylate
2-Ethylhexyl acrylate
Hexanediol diacrylate
Dipropylene glycol diacrylate
Dimethyl succinate
Dimethyl glutarate
Dimethyl adipate
Dibutyl fumarate
Dibutyl maleate
Diisobutyl succinate
Diisobutyl glutarate
Butyrolactone
Dimethyl phthalate
Diethyl phthalate[2]
Dipropyl phthalate[2]
Dibutyl phthalate[2]
Diisobutyl phthalate[2]

**Chlorinated hydrocarbons (17)**
Dichloromethane[1]
Trichloromethane (Chloroform)[4]
Tetrachloromethane
1,2-Dichloroethane[4]
1,1,1-Trichloroethane
2-Chloropropane
1,2,3-Trichloropropane[4]
Trichloroethene[4]
Tetrachloroethene
trans-1,3-Dichloropropene[4]
cis-1,3-Dichloropropene[4]
Chloroprene[4]
1,3-Dichloro-2-propanol[4]
Chlorobenzene
1,4-Dichlorobenzene
alpha-Chlorotoluene[4]
alpha,alpha,alpha-Trichlorotoluene[4]

**Cyclic siloxanes (5)**
Hexamethylcyclotrisiloxane (D3)
Octamethylcyclotetrasiloxane (D4)
Decamethylcyclopentasiloxane (D5)
Dodecamethylcyclohexasiloxane (D6)
Tetradecamethylcycoheptasiloxane (D7)

**Others (41)**
1,4-Dioxane[4]
1,2-Dibromoethane[4]
2-Nitropropane[4]
2,3-Dinitrotoluene[4]
2,4-Dinitrotoluene[4]
2,6-Dinitrotoluene[4]
3,4-Dinitrotoluene[2,4]
o-Anisidine[4]
o-Toluidine[4]
4-Chloro-o-toluidine[4]
5-Nitro-o-toluidine[2]
Acrylonitrile[1,4]
2,2'-Azobisisobutyronitrile
Tetramethylsuccinonitrile
Azobenzene[2,4]
Caprolactam
Furan[1,4]
2-Methylfuran
2-Pentylfuran
Methenamine
Triethylamine
2-Butanonoxime[4]
Triethyl phosphate
Tributyl phosphate[2]
5-Chloro-2-methyl-4-isothiazolin-3-one (CIT)
2-Methyl-4-isothiazolin-3-one (MIT)
2-n-Octyl-4-isothiazolin-3-one (OIT)[2,4]
Formamide
Dimethylformamide (DMF)
Acetamide
N-Nitrosopyrrolidine[4]
N-Methyl-2-pyrrolidone
N-Ethyl-2-pyrrolidone
N-Butyl-2-pyrrolidone
Aniline
4-Chloroaniline[4]
2-Nitroanisole[4]
Cyclohexyl isocyanate
p-Cresidine[4]
Diethyl sulfate[4]
Epichlorohydrin[4]

1 VVOC
2 SVOC
3 Analysis acc. to DIN ISO 16000-3:2013-01 (DNPH)
4 Carcinogens, category 1A and 1B according to Regulation (EC) No 1272/2008 and TRGS 905

## Definition of terms

| | |
|---|---|
| VOC<br>(volatile organic compounds) | All individual compounds with a concentration ≥ 1 µg/m³ in the retention range $C_6$ (n-Hexane) to $C_{16}$ (n-Hexadecane) |
| TVOC | Total volatile organic compounds |
| TVOC according to<br>DIN EN 16516 | Sum of all VOC ≥ 5 µg/m³ in the retention range $C_6$ to $C_{16}$, calculated as toluene equivalent (used, among others, with M1) |
| TVOC according to AgBB | Sum of all identified and calibrated VOC ≥ 5 µg/m³ with LCI and not calibrated VOC ≥ 5 µg/m³ calculated as toluene equivalent (also used, among others, for the Blue Angel) |
| TVOC according to eco-INSTITUT-Label | Sum of all identified and calibrated VOC ≥ 1 µg/m³ and not calibrated VOC ≥ 1 µg/m³ calculated as toluene equivalent (also used for natureplus) |
| TVOC according to DIN ISO 16000-6 | Total area of chromatogram in the retention range $C_6$ to $C_{16}$, calculated as toluene equivalent (used, among others, by CDPH, BIFMA or the French VOC Regulation) |
| TVOC without LCI according to AgBB | Sum of all VOC without NIK ≥ 5 µg/m³ in the retention range $C_6$ to $C_{16}$ |
| TVOC without LCI according to eco-INSTITUT-Label | Sum of all VOC without NIK ≥ 1 µg/m³ in the retention range $C_6$ to $C_{16}$ |
| CMR-VOC<br>(carcinogenic, mutagenic, reproduction-toxic VOC, VVOC and SVOC) | All individual substances with the following categories:<br>Regulation (EC) No. 1272/2008: Category Car.1A and 1B, Muta. 1A and 1B, Repr. 1A and 1B<br>TRGS 905: K1A, K1B, M1A, M1B, R1A, R1B<br>IARC: Group 1 and 2A<br>DFG (MAK lists): Category III1and III2 |
| VVOC<br>(very volatile organic compounds) | All individual substances with a concentration ≥ 1 µg/m³ in the retention range < $C_6$ |
| TVVOC | Total very volatile organic compounds |
| TVVOC according to AgBB | Sum of all identified and calibrated VVOC ≥ 5 µg/m³ with LCI |
| TVVOC according to eco-INSTITUT-Label | Sum of all identified and calibrated VVOC ≥ 1 µg/m³ with LCI |
| SVOC (semi volatile organic compounds) | All individual substances ≥ 1 µg/m³ in the retention range $C_{16}$ (n-hexadecane) to $C_{22}$ (docosane) |
| TSVOC | Total semi volatile organic compounds |
| TSVOC according to DIN EN 16516 | Sum of all SVOC in the retention range $C_{16}$ to $C_{22}$, calculated as toluene equivalent |
| TSVOC without LCI according to AgBB | Sum of all SVOC ≥ 5 µg/m³ without LCI |
| TSVOC without LCI according to eco-INSTITUT-Label | Sum of all SVOC ≥ 1 µg/m³ without LCI |
| TSVOC with LCI according to AgBB | Sum of all substance-specific calibrated and SVOC ≥ 5 µg/m³ with LCI |
| SER | Specific emission rate (see "Explanation of Specific Emission Rate SER") |
| LCI value | Lowest Concentration of Interest; calculated value for the evaluation of VOC, established by the Committee for Health-related Evaluation of Building Products (Ausschuss zur gesundheitlichen Bewertung von Bauprodukten - AgBB) |

| | |
|---|---|
| R value | The quotient of the concentration and the LCI value is generated for every substance which is detected in the test chamber air.<br>The sum of the calculated quotients results in the R value. |
| R value according to eco-INSTITUT-Label | R value for all identified substances ≥ 1 µg/m³ with LCI, established by the AgBB |
| R value according to AgBB | R value for all identified substances ≥ 5 µg/m³ with LCI, established by the AgBB |
| R value according to Belgian regulation | R value for all identified substances ≥ 5 µg/m³ with LCI, established by the Belgian regulation |
| R value according to EU-LCI | R value for all identified substances ≥ 5 µg/m³ with EU-LCI value, established by the European Commission |
| RT (retention time) | Time for a particular analyte to pass through the system (from the column inlet to the detector) |
| CAS No.<br>(Chemical Abstracts Service) | International unique numerical identifier for a chemical substance |
| Toluene equivalent | Concentration of the substance detected in the test chamber air for which the quantification was carried out with regard to toluene. |

## Commentary on emission analysis

Test method

Measurement of the volatile organic compounds takes place in the test chamber in conditions similar to those applying in practice. Standardized test conditions are defined for the test chamber regarding loading, air exchange, relative humidity, temperature, and incoming air, based on the type of test specimen and the required guideline. These conditions and the underlying standards are to be found in the section on test methods in the laboratory report.

Air samples are taken from the test chamber at defined points in time during the continuously running test. To this end, approximately 5 L of air are collected from the test chamber at an air flow rate of 100 mL/min on Tenax and approx. 100 L at an air flow rate of 0.8 L/min on silica gel coated with DNPH (2,4-dinitrophenylhydrazine).

After thermal desorption, the substances adsorbed on Tenax are analysed using gas chromatographic separation and mass spectrometric determination. The gas chromatographic separation is performed with a slightly polar capillary column of 60 m in length.

The substances derivatized with DNPH for the determination of formaldehyde and other short-chain carbonyl compounds (C1 - C6) are analysed using high-performance liquid chromatography (HPLC).

Over 200 compounds, including volatile organic compounds (C6 - C16), semi-volatile organic compounds (C16 - C22) and – insofar as possible with this method – also very volatile organic compounds (less than C6) are determined and quantified individually.

All other substances – insofar as is possible – are identified through comparison with a library of spectra. The quantification of these substances and non-identified substances is performed through a comparison of their signal area with the signal of toluene.

The determined substance concentrations are corrected using the recovery rate of the internal standard (toluene-d8). Identification and quantification of substances is carried out from a concentration (limit of quantification) of 1 µg per m³ test chamber air or 2 µg/m³ for DNPH-derivatised substances. In the case of highly loaded samples, the evaluation limit of non-calibrated substances is raised in some cases, as it is no longer possible to assign individual, small signals due to the large number of signals.

Quality assurance

The eco-INSTITUT Germany GmbH is granted flexible scope of accreditation pursuant to DIN EN ISO/IEC 17025:2018-03. The accreditation covers the analytical determination of all volatile organic compounds, including the test chamber method.

In each analysis the analytical system is checked using an external standard based on the specifications in standard DIN EN 16516:2020-10. The stability of the analytical systems is documented based on the test standard using control charts.

Laboratory performance is assessed at least once a year in inter-laboratory comparisons by comparing the results with those obtained by other laboratories for identical samples.

A blank is run prior to introducing the test specimen into the test chamber to check for the possible presence of volatile organic compounds.

The expanded measurement uncertainty U for the analytical determination of all volatile organic compounds, including the test chamber method, is estimated to 41.7 %. The calculation is based on DIN ISO 11352:2013-03 (Nordtest).

## Explanation of Specific Emission Rate SER

Emission measurements are accomplished in test chambers under defined physical conditions (temperature, relative humidity, room loading, air change rate etc.).

Test chamber measurement results are directly comparable only if the investigations were accomplished under the same basic conditions.

If the differences of the physical conditions refer only to the change of air rate and/or the loading, the "SER" or "specific emission rate" can be used for comparability of the measurement results. The SER indicates how many volatile organic compounds (VOC) are released by the sample for each material unit and hour (h).

The SER can be calculated using the formula below for each proven individual component of the VOC from the data in the test report.

As material units the following are applicable:

| | |
|---|---|
| l = unit of length (m) | relation between emission and length |
| a = unit area ($m^2$) | relation between emission and surface |
| v = unit volume ($m^3$) | relation between emission and volume |
| u = piece unit (unit = piece) | relation between emission and complete unit |

From this the different dimensions for SER result:

| | | |
|---|---|---|
| length-specific | $SER_l$ | in µg/(m·h) |
| surface-specific | $SER_a$ | in µg/($m^2$·h) |
| volume-specific | $SER_v$ | in µg/($m^3$·h) |
| unit specific | $SER_u$ | in µg/(u·h) |

SER thus represents a product specific rate, which describes the mass of the volatile organic compound, which is emitted by the product per time unit at a certain time after beginning of the examination.

$$SER = q \cdot c$$

q specific air flow rate (quotient from change of air rate and loading)

c concentration of the measured substance(s)

The result can be indicated in milligrams (mg) in place of micro grams (µg), whereby 1 mg = 1000 µg.