inegi driving science & innovation

Since 1986

MAIS DE 35 ANOS
A CONVERTER
CONHECIMENTO
EM VALOR

Laboratório Qualidade do Ar Interior

IPAC acreditação
L0715
ISO/IEC 17025
Ensaios

ilac-MRA

Determination of VOC emissions, formaldehyde, acetaldehyde and other CMR substances from building products (French Legislation)

Process: LQAI.MC.35/23
Report No. LQAI.2023.357

Identification of the Material: Primecork
Client: Vasco Emanuel, Lda.

U.PORTO

IPAC is a signatory to the EA MLA and ILAC MRA for testing.
The results presented refer only to the item tested.
This document may not be reproduced except in full, without written agreement of INEGI.

0. DOCUMENTAL CONTROL

0.1 IDENTIFICATION OF DOCUMENT

Project	---
Name of Document	Determination of VOC emissions, formaldehyde, acetaldehyde and other CMR substances from building products (French Legislation)
Name of file	---

0.2 CONTROL OF VERSIONS

Version	Edition	Revision	Date	Description	Approved by
1	1	0	2023/09/29	Original version	SM

0.3 AUTHOR(S)

Name	Entity	Initials
Susana Martins / Responsável Técnico do Laboratório	INEGI	SM

0.4 REVISER(S)

Name	Entity	Initials
Anabela Martins / Técnico de Laboratório Coordenador	INEGI	AM

0.5 LIST OF DISTRIBUTION

Name	Entity	Initials
Laboratório Qualidade Ar Interior	INEGI	LQAI
	Vasco Emanuel, Lda.	

TABLE OF CONTENTS

1. SAMPLE IDENTIFICATION

Sample name: Primecork

Product type: Cork wall product

Production date: ---

Batch no.: ---

Sampling: client

Sampling date: ---

Packing material: Card box

number of packages: 1box with 12 pieces

Sample reception at LQAI: 28/07/2023

For more information see Annex A: Sampling report completed by the client.

2. OBJECTIVE

Determination of emitted volatile organic compounds, formaldehyde, acetaldehyde and some CMR substances (carcinogenic, mutagenic and reprotoxic) intending the material classification according to the criteria established by the French legislation.

3. CLIENT

Vasco Emanuel, Lda
Rua Pedro Homem de Melo, 432 – 1º Esq.
4150-598 Porto

Reference of Proposal: PE30230650 by 16/05/2023

4. METHODOLOGIES USED

The selection of the product sample was the sole responsibility of the client. Results apply to sample as received. The tests and analysis presented were carried out in the permanent facilities of the laboratory.

The sample was prepared according ISO 16000-11[1], in the facilities of the laboratory on 2023/08/02 (picture of sample in annex B). Note that sample preparation is outside the scope of laboratory accreditation.

The test in the test chamber started on 2023/08/02 and was performed in accordance with the internal procedure IT.403 (annex C). This test is accredited in accordance with EN ISO/IEC 17025[2] for the compounds:

Test	Method
Determination of the emission of benzene from building products and furnishing — Emission test chamber method	IT.403.07
Determination of the emission of toluene from building products and furnishing — Emission test chamber method	IT.403.07
Determination of the emission of ethylbenzene from building products and furnishing — Emission test chamber method	IT.403.07
Determination of the emission of 2-ethyl-1-hexanol from building products and furnishing — Emission test chamber method	IT.403.07
Determination of the emission of limonene from building products and furnishing — Emission test chamber method	IT.403.07
Determination of the emission of tridecane from building products and furnishing — Emission test chamber method	IT.403.07
Determination of the emission of 1,2,4-trimethylbenzene from building products and furnishing — Emission test chamber method	IT.403.07

Note: IT.nnn.nn indicates internal laboratory procedure.

It should be noted that the remaining compounds determined in this test and are out the scope of accreditation, are determined using the same quality standards that apply to them.

The VOCs samples were collected, in tubes with Tenax TA, when the test chamber was empty (2023/08/02, volume: 5.64 l) and 28 days (2023/08/30, volume: 5.66 l) after starting the test. The uncertainty associated with this sampling, calculated using the expansion factor of 2.01 which corresponds to a 95% confidence level, was 5.2%.

Formaldehyde and acetaldehyde were collected in cartridges impregnated with DNPH when the test chamber was empty (2023/08/02, volume: 81.9 l) and 28 days (2023/08/30, volume: 84.3 l) after starting the test. The collection of formaldehyde and acetaldehyde is out the scope of accreditation.

The experimental conditions in the chamber during the conditioning time and the study were:

Period	T (°C)	HR (%)	v (m/s)	n (h^{-1})	A/V (m^2/m^3)
28 days	22.9±0.1	49.8±1.4	0.17	0.65	1.28

where *T* is the temperature, *HR* the relative humidity, *v* the air velocity at the surface of the material, *n* the air exchange rate and *A/V* the ratio of sample area to chamber volume (loading factor). The volume of the chamber used is 0.141 m^3.

For the analysis, thermal desorption on line with gas chromatography coupled to a mass spectrometer detector for VOC identification and quantification (GC/MSD) was used. The GC used is from Agilent Technologies, model 7890 and the mass spectrometer detector is from Agilent also, model 5975C. The thermal desorption system is from DANI, model TD Master. The analysis was conducted on 2023/09/25 and was performed in accordance to the internal procedure IT.401 (annex C). This test is accredited in accordance with EN ISO/IEC 17025[2] for the compounds:

Test	Method
Determination of Benzene by thermal desorption and Gas chromatography with mass selective detector	IT.401.09
Determination of Toluene by thermal desorption and Gas chromatography with mass selective detector	IT.401.09
Determination of Octane by thermal desorption and Gas chromatography with mass selective detector	IT.401.09
Determination of Ethylbenzene by thermal desorption and Gas chromatography with mass selective detector	IT.401.09
Determination of 2-Ethoxyethylacetate by thermal desorption and Gas chromatography with mass selective detector	IT.401.09
Determination of 1,2,4-trimethylbenzene by thermal desorption and Gas chromatography with mass selective detector	IT.401.09
Determination of 2-ethyl-1-hexanol by thermal desorption and Gas chromatography with mass selective detector	IT.401.09
Determination of limonene by thermal desorption and Gas chromatography with mass selective detector	IT.401.09
Determination of dodecane by thermal desorption and Gas chromatography with mass selective detector	IT.401.09
Determination of 2-phenoyethanol by thermal desorption and Gas chromatography with mass selective detector	IT.401.09
Determination of tridecane by thermal desorption and Gas chromatography with mass selective detector	IT.401.09
Determination of styrene by thermal desorption and Gas chromatography with mass selective detector	IT.401.09
Determination of tetrachloroethylene by thermal desorption and Gas chromatography with mass selective detector	IT.401.09
Determination of 2-butoxyethanol by thermal desorption and Gas chromatography with mass selective detector	IT.401.09
Determination of naphthalene by thermal desorption and Gas chromatography with mass selective detector	IT.401.09

Nota: IT.nnn.nn indicates internal laboratory procedure.

It should be noted that the remaining compounds determined in this test which are not covered by the accreditation are determined using the same quality standards as applied to them.

The emission factors of the identified compounds were determined using the specific response factor. Total volatile organic compounds (TVOC) concentration was calculated for all compounds eluted between hexane and hexadecane, using the toluene response factor.

The global expanded uncertainties (resulting from the combination of sampling and analysis uncertainties – IT401 and IT.403) obtained for each of the compounds are shown below. The expanded uncertainty was calculated using the expansion factor of 2.01, corresponding to a 95% confidence level.

Compound	Global Expanded Uncertainty
Benzene (IT401and IT403)	34%
Toluene (IT401 and IT403)	28%
Ethylbenzene (IT401 and IT403)	28%
2-ethyl-1-hexanol (IT401 and IT403)	28%
Limonene (IT401 and IT403)	27%
Tridecane (IT401 and IT403)	28%
1,2,4-Trimethylbenzene (IT401 and IT403)	26%

Formaldehyde and acetaldehyde were determined according to ISO 16000-3[3]. Specifically, the compounds were analysed by high performance liquid chromatography (HPLC) using a chromatograph Agilent Technologies brand, model 1220 Infinity LC. The emission factor of the compounds was calculated based on the specific response factor of the analytical method. The analysis took place on 2023/08/04 and 2023/09/06. The uncertainty of the analytical method is ±8.4% for formaldehyde and ±8.6% for acetaldehyde. This analysis is out the scope of accreditation.

5. RESULTS

Table 1 shows the concentrations of substances or groups of substances, obtained for a specific ventilation rate of 0.5 $m^3 h^{-1}m^{-2}$ (test scenario: wall), as well as the concentration limits (µg/m^3) for different classes established by the French legislation (DEVL1101903D and DEVL1104875A)[4].

Table 1. Limit values established by the French legislation and concentrations observed for the material after 28 days of exposure for a specific ventilation rate of 0.5 $m^3h^{-1}m^{-2}$.

		Concentration (µg/m^3)				
		Classes				MC.35/23
Compound	CAS	C	B	A	**A+**	28 days
Formaldehyde⁺	50-00-0	>120	<120	<60	**<10**	4.92
Acetaldehyde⁺	75-07-0	>400	<400	<300	**<200**	3.92
Toluene	108-88-3	>600	<600	<450	**<300**	1.52
Tetrachloroethylene⁺	127-18-4	>500	<500	<350	**<250**	< 0.92*
Xylene⁺	1330-20-7	>400	<400	<300	**<200**	< 0.90*^{T}
1,2,4-trimethylbenzene	95-63-6	>2000	<2000	<1500	**<1000**	< 0.88*
1,4-dichlorobenzene⁺	106-46-7	>120	<120	<90	**<60**	< 0.90*^{T}
Ethylbenzene	100-41-4	>1500	<1500	<1000	**<750**	< 0.88*
2-butoxyethanol⁺	111-76-2	>2000	<2000	<1500	**<1000**	< 4.8*
Styrene⁺	100-42-5	>500	<500	<350	**<250**	< 0.91*
TVOC⁺		>2000	<2000	<1500	**<1000**	27.4

* Limit of quantification.
*^{T} Limit of quantification calculated for toluene
⁺ Out of the scope of accreditation.

Table 2 lists the concentration limits (µg/m^3) for CMR substances, imposed by the French legislation (DEVP0908633A and DEVP0910046A)[5] and the observed values for the material under study to a specific ventilation rate of 0.5 $m^3h^{-1}m^{-2}$.

Table 2. Limit values established by the French legislation and concentrations observed for the material after 28 days of exposure for a specific ventilation rate of 0.5 $m^3h^{-1}m^{-2}$.

		Concentration (µg/m^3)	
Compound	CAS	Limit	MC.35/23 28 days
Trichloroethylene⁺	79-01-6	< 1 µg/m^3	n.d.
Benzene	71-43-2	< 1 µg/m^3	n.d.*
Bis(2-ethylhexyl) phthalate⁺ (DEHP)	117-81-7	< 1 µg/m^3	n.d.**
Dibutyl phthalate (DBP)⁺	84-74-2	< 1 µg/m^3	n.d.

n.d. – not detected, which means lower than the limit of detection.
* Limit of quantification for benzene = 0.79 µg/m^3.
** Although it has not been evaluated analytically it is considered that this compound is not present in the emissions of the material under study, as stated by the manufacturer in the attached declaration
⁺ Out of the scope of accreditation.

6. GENERAL CONCLUSIONS

By customer request, the results obtained are compared with the criteria established by French regulations [4,5]. The decision rule chosen is that uncertainty is not applied to the final result. In other words, the result obtained is directly compared with the established criteria, without considering the uncertainty associated with this result.

The results presented in Table 1 and 2 shows that the material "Primecork" is rated ***A+*** according to the French regulations and meets the criteria established by legislation[4,5].

7. REFERENCES

1- ISO 16000-11 (2006). Determination of the emission of volatile organic compounds from building products and furnishing — Sampling, storage of samples and preparation of test specimens (2006).
2- NP EN ISO/IEC 17025:2018 – Requisitos gerais de competência para laboratórios de ensaio e calibração
3- ISO 16000-3 (2022). Determination of formaldehyde and other carbonyl compounds - Active sampling method.
4- Décret n° 2011-321 du 23 mars 2011 (DEVL1101903D) y Arrêté du 19 avril 2011 (DEVL1104875A) relatif à l'étiquetage des produits de construction ou de revêtement de mur ou de sol et des peintures et vernis sur leurs émissions de polluants volatils.
5- Arrêté du 30 avril 2009 (DEVP0908633A) y Arrête du 28 mai 2009 (DEVP0910046A) relatif aux conditions de mise sur le marché des produits de construction et de décoration contenant des substances cancérigènes, mutagènes ou reprotoxiques de catégorie 1 ou 2.

Porto, 29 September 2023

Susana Martins

Digitally signed by [Assinatura Qualificada] Susana Daniela da Silva Martins
Date: 2023.09.29 15:36:06 +01'00'

(Head of Laboratory)

Annex A: Sampling report completed by the client.

inegi driving science & innovation

Laboratório da Qualidade do Ar Interior

Report of the Sampling Procedure

Testing laboratory / certification body:		Sampler (name , company, telephone):	
Name of the manufacturer at the place of sampling (address/stamp):	Vasco Emanuel, Lda	Manufacturer (if deviating from company´s name at the place of sampling):	Vasco Emanuel, Lda
Name of the product:	Primecork	Type of product (e.g. paint, laminate, textile flooring, PVC-flooring).	Cork wall product
Model/program/series:	Classic e Premium	Batch nº:	
Article Nº:		Date of batch production:	
Sample is taken from:	☒ Production ☐ Store ☐ Retain samples ☐ Miscellaneous	How had the product been stored prior to sampling?	☒ Open ☐ Wrapped up
	Place of storage: warehouse		Packing material: Cartoon box

Sample Description/ Application *mention where applicable:* Density % Solids by weight Spread rate Application type (e.g. walls, floor, doors, sealants)	1 box has 12 pieces and weights 6,20Kg Application for walls
Specifics (Possible negative influences by emission at the place of taking the sample, petrol emissions, solvent emissions from production, uncertainties, questions, etc.):	NO
Cut edges (identification of cut edges when present and identification of new surfaces and surface to be exposed in the emission test):	

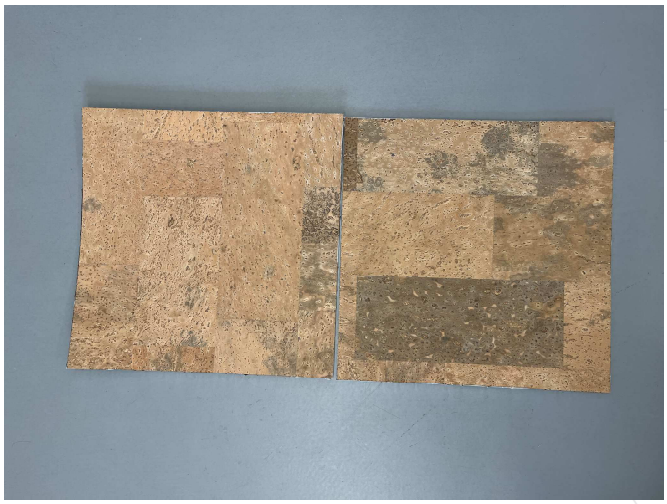
Confirmation

The signer herewith confirms the correctness of the data given above. The sample was selected, drawn and packed personally in accordance with the instructions for the taking of samples.

Date 31 Julho 2023	Signature (stamp) Vasco Emanuel, Lda. NIF: 510547010

Please attach the Technical Data Sheet of the product.

Annex B – Photo of the sample of the material under study



Annex C – Bibliography that supported the elaboration of the internal procedures IT403 and IT401:

- ISO 16000-6 (2021): Determination of volatile organic compounds in indoor and test chamber air by active sampling on Tenax TA® sorbent, thermal desorption and gas chromatography using MS or MS-FID.

- ISO 16000-9 (2006): Determination of the emission of volatile organic compounds from building products and furnishing - Emission test chamber method.

- ISO 16000-11 (2006): Determination of the emission of volatile organic compounds from building products and furnishing — Sampling, storage of samples and preparation of test specimens.

- EN 16516:2017. Construction products: Assessment of release of dangerous substances - Determination of emissions into indoor air

Vasco
Emanuel
Lda

03 de Agosto de 2023

DECLARAÇÃO

We declare that in the production of our Primecork product, we do not use the compound bis (2-ethylhexyl) phthalate (DEHP).

With our best compliments,

Vasco Emanuel, Lda.
NIF: 510547010

Vasco Emanuel, Lda
Rua Pedro Homem de Melo, 432, 1 esq
4150-598 Porto – Portugal
VAT number: PT510547010
Web: www.muratto.com
Email: geral@muratto.com

muratto®
natural surface design

trizzano
senses in cork

inegi driving science & innovation

Since 1986

U.PORTO

inegi driving science & innovation

Since 1986

MAIS DE 35 ANOS
A CONVERTER
CONHECIMENTO
EM VALOR

INEGI - Instituto de Ciência e Inovação
em Engenharia Mecânica e Engenharia Industrial

Campus da FEUP | Rua Dr. Roberto Frias, 400 | 4200-465 Porto | PORTUGAL
T. +351 22 957 87 10 | F. +351 22 953 73 52 | inegi@inegi.up.pt

www.inegi.up.pt