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LABORATÓRIO DA QUALIDADE DO AR INTERIOR

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

AMORIM ISOLAMENTOS S.A.
REPORT Nr. LQAI.2018.177

Process: LQAI.MC. 50/18

Identification of the Material: Expanded Insulation Corkboard (black)



0 Documental Control

0.1 Identification of Document

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1. 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.

2. Client

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Reference of Proposal: PE30180351 from 21 march 2018

3. Methodologies used

The study was conducted on a sample of building product, designated as “Expanded Insulation Corkboard (black)”. The sample was delivered at LQAI on 2018/04/06. The selection of the product sample was the sole responsibility of the client. Note that sample preparation is outside the scope of laboratory accreditation.

The test in the test chamber started on 2018/04/23 and was performed based on standard EN 16516¹ and according to the internal proceeding IT.403 (based on ISO 16000-9²). This test is accredited in accordance with EN ISO / IEC 17025³ for the compounds:

Test	Method
Determination of Benzene – method of emission in test chamber	IT.403.04
Determination of Toluene - method of emission in test chamber	IT.403.04
Determination of Ethylbenzene - method of emission in test chamber	IT.403.04

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 (2018/04/23, volume: 5,5 l) and in duplicate after 28 days (2018/05/21, average volume: 5,8 l) after starting the test.

Formaldehyde and acetaldehyde were collected in cartridges impregnated with DNPH when the test chamber was empty (2018/04/23, volume: 83,6 l) and after 28 days (2018/05/21, volume: 80,5 l) after starting the test.

The experimental conditions in the chamber during the study were:

Period	T (°C)	HR (%)	v (m/s)	n (h ⁻¹)	A/V (m ² /m ³)
Test	22,7±0,4	47,5±2,8	0,17	0,34	0,71

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 0.255 m³.

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 6890N and the mass spectrometer detector is from Agilent also, model 5973. The thermal desorption system is from DANI, model STD 33.50. The analysis was conducted on 2018/05/23 and 2018/06/25 based on standard EN16516¹ and according to the internal proceeding IT.401 (based on ISO 16000-6⁴). This test is accredited in accordance with EN ISO / IEC 17025³ for the compounds:

Test	Method	Uncertainty
Determination of Benzene by thermal desorption and Gas chromatography with mass selective detector	IT.401.03	5,7
Determination of Toluene by thermal desorption and Gas chromatography with mass selective detector	IT.401.03	5,2
Determination of Ethylbenzene by thermal desorption and Gas chromatography with mass selective detector	IT.401.03	6,9
Determination of 1,2,4-trimethylbenzene by thermal desorption and Gas chromatography with mass selective detector	IT.401.03	6,6

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.

Formaldehyde and acetaldehyde were determined according to the internal proceeding IT.402 (based on ISO 16000-3⁵). Specifically, the compounds were analysed by high performance liquid chromatography (HPLC) using a gas 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 2018/05/04 and 2018/05/28. The uncertainty of the analytical method for formaldehyde is $\pm 12,8\%$ and for acetaldehyde is $\pm 12,0\%$. This analysis is out the scope of accreditation.

4. Results

Table 1 shows the concentrations of substances or groups of substances, obtained for a specific ventilation rate of $0.5 \text{ m}^3\text{h}^{-1}\text{m}^{-2}$, as well as the concentration limits ($\mu\text{g}/\text{m}^3$) for different classes established by the French legislation⁶.

Table 2 lists the concentration limits ($\mu\text{g}/\text{m}^3$) for CMR substances, imposed by the French legislation⁷ and the observed values for the material under study to a specific ventilation rate of $0.5 \text{ m}^3\text{h}^{-1}\text{m}^{-2}$.

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 $0.5 \text{ m}^3\text{h}^{-1}\text{m}^{-2}$.

Compound	CAS	Concentration ($\mu\text{g}/\text{m}^3$)				MC.50/18 28 days
		Classes				
		C	B	A	A+	
Formaldehyde ⁺	50-00-0	>120	<120	<60	<10	<1,6*
Acetaldehyde ⁺	75-07-0	>400	<400	<300	<200	55,4
Toluene	108-88-3	>600	<600	<450	<300	1,7
Tetrachloroethylene ⁺	127-18-4	>500	<500	<350	<250	< 2,0**
Xylene ⁺	1330-20-7	>400	<400	<300	<200	< 0,5**
1,2,4-trimethylbenzene	95-63-6	>2000	<2000	<1500	<1000	< 0,6**
1,4-dichlorobenzene ⁺	106-46-7	>120	<120	<90	<60	< 0,4** ^T
Ethylbenzene	100-41-4	>1500	<1500	<1000	<750	< 0,5**
2-butoxyethanol ⁺	111-76-2	>2000	<2000	<1500	<1000	< 1,1**
Styrene ⁺	100-42-5	>500	<500	<350	<250	< 0,3**
TVOC ⁺		>2000	<2000	<1500	<1000	44,1

* LOQ – Limit of Quantification

** LOD – Limit of Detection

**^T Limit of detection calculated for toluene.

⁺ Out of the scope of accreditation.

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 $0.5 \text{ m}^3\text{h}^{-1}\text{m}^{-2}$.

Compound	CAS	Concentration ($\mu\text{g}/\text{m}^3$)	MC.50/18 28 days
		Limit	
Trichloroethylene ⁺	79-01-6	< $1 \mu\text{g}/\text{m}^3$	n.d.
Benzene	71-43-2	< $1 \mu\text{g}/\text{m}^3$	n.d.*
Bis(2-ethylhexyl) phthalate ⁺	117-81-7	< $1 \mu\text{g}/\text{m}^3$	n.d.**
Dibutyl phthalate (DBP) ⁺	84-74-2	< $1 \mu\text{g}/\text{m}^3$	n.d.

n.d. – not detected, which means lower than the limit of detection.

* Limit of Quantification for benzene = $0,77 \mu\text{g}/\text{m}^3$.

** 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.


5. General conclusions

The results presented in Table 1 and 2 shows that the material “Expanded Insulation Corkboard (black)” is rated **A+** according to the French regulations and meets the criteria established by legislation.

6. References

- 1.- EN 16516 (2017). Construction products: Assessment of release of dangerous substances - Determination of emissions into indoor air.
- 2.- ISO 16000-9 (2006). Determination of the emission of volatile organic compounds from building products and furnishing - Emission test chamber method.
- 3.- NP EN ISO/IEC 17025:2005 – Requisitos gerais de competência para laboratórios de ensaio e calibração.
- 4.- ISO 16000-6 (2011). 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/FID.
- 5.- ISO 16000-3 (2011). Determination of formaldehyde and other carbonyl compounds - Active sampling method.
- 6.- Arrêté du 19 avril 2011 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.
- 7.- Arrêté du 30 avril 2009 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, 5 July 2018



(Head of Laboratory)

Annex: Photo of the sample of the material under study





AMORIM

Amorim Isolamentos, S.A.

DECLARATION

AMORIM ISOLAMENTOS, SA located at Vendas Novas – Portugal, manufacturer of **EXPANDED INSULATION CORKBOARD** (black), wish to declare during their industrial process, don't use the composition **DEHP** or any type of additives.

The used raw material is cork coming directly from Cork Forest without any previous treatment.

The industrial process consist uniquely steam temperature and pressure, means the final product is 100% natural.

A Administration
2018.06.02

AMORIM ISOLAMENTOS, S.A.
Administração



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