

## Test report

Determination of VOC emissions, formaldehyde,  
acetaldehyde and other CMR substances from building  
products

Requester:

Identification of the Material: CR-108

**Process: LQAI.MC.34/13**

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**Identification of the Material tested:** CR-108

Gilberto

In response to a request from a study was conducted on a sample, designated as 'CR-108'. The sample was delivered at LQAI on 11th April 2013.

The emissions were monitored, from a test chamber, for 28 days of exposure, according to the norm ISO 16000-9<sup>1</sup>. The air samples were collected in tubes with Tenax TA. 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 30/05 and 05/06 according to the norm ISO 16000-6<sup>2</sup>. The emission factors of the major compounds were determined using the specific response factor of each identified compound, when possible. Total volatile organic compounds (TVOC) concentration was calculated for all compounds eluted between hexane and hexadecane, using the toluene response factor. The uncertainty of the analytical method, calculated for toluene is  $\pm 5.1\%$ .

Formaldehyde was determined according to the norm ISO 16000-3<sup>3</sup>, together with acetaldehyde. Specifically, after 28 days, the aldehydes were collected in cartridges impregnated with DNPH and 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 22/05/2013.

The average experimental conditions in the chamber during the study were:

T (°C)	HR (%)	v (m/s)	n (h <sup>-1</sup> )	A/V (m <sup>2</sup> /m <sup>3</sup> )
23.2	49.2	0.13	0.53	1.10

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 m<sup>3</sup>.

The aim of the study was to determine the quantity 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 recent French legislation<sup>4,5</sup>.

Table 1 shows the concentrations of substances or groups of substances, obtained for a specific ventilation rate of 0.5 m<sup>3</sup>h<sup>-1</sup>m<sup>-2</sup>, as well as the concentration limits (µg/m<sup>3</sup>) for different classes established by the French legislation<sup>4</sup>.

Table 1. Limit values established by the French legislation<sup>4</sup> and concentrations observed for the material after 28 days of exposure for a specific ventilation rate of 0.5 m<sup>3</sup>h<sup>-1</sup>m<sup>-2</sup>.

Compound	CAS	Concentration (µg/m <sup>3</sup> )				MC.34/13 28 days
		Classes				
		C	B	A	A+	
Formaldehyde	50-00-0	>120	<120	<60	<10	n.d.
Acetaldehyde	75-07-0	>400	<400	<300	<200	n.d.
Toluene	108-88-3	>600	<600	<450	<300	2.39
Tetrachloroethylene	127-18-4	>500	<500	<350	<250	n.d.
Xylene	1330-20-7	>400	<400	<300	<200	n.d.
1,2,4-trimethylbenzene	95-63-6	>2000	<2000	<1500	<1000	n.d.
1,4-dichlorobenzene	106-46-7	>120	<120	<90	<60	n.d.
Ethylbenzene	100-41-4	>1500	<1500	<1000	<750	n.d.
2-butoxyethanol	111-76-2	>2000	<2000	<1500	<1000	n.d.
Styrene	100-42-5	>500	<500	<350	<250	n.d.
TVOC		>2000	<2000	<1500	<1000	68.3

n.d. – not detected

Table 2 lists the concentration limits (µg/m<sup>3</sup>) for CMR substances, imposed by the French legislation<sup>5</sup> and the observed values for the material under study to a specific ventilation rate of 0.5 m<sup>3</sup>h<sup>-1</sup>m<sup>-2</sup>.



Table 2. Limit values established by the French legislation<sup>5</sup> 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 ( $\mu\text{g}/\text{m}^3$ )	
		Limit	MC.34/13 28 days
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 (DEHP)	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

\* 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

## Discussion of the Results and Conclusions

The results presented in Table 1 and 2 shows that the material is rated **A<sup>+</sup>** according to the French regulations and meets the criteria established by legislation.

### References:

- 1.- ISO 16000-9 (2006). Determination of the emission of volatile organic compounds from building products and furnishing - Emission test chamber method.
- 2.- 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.
- 3.- ISO 16000-3 (2001). Determination of formaldehyde and other carbonyl compounds - Active sampling method.
- 4.- 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.
- 5.- Arrêté du 28 mai 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, 14 June 2013

*Gabriela Ventura Alves da Silva*

Gabriela Ventura Alves da Silva  
(Director of LQAI)

To Whom It May Concern :

declares that CR-105 and CR-108 cork agglomerate materials are produced with a polyurethane binder that doesn 't have any type of phtalate.

The response provided by is based upon our knowledge of the raw materials used in its manufacture is accurate to the best of our knowledge.

If we may be of any further assistance, please do not hesitate to contact us via email or by calling.

Quality & Product Development

11 of June 2013



PORTUGAL



Activity # 2