

Test report

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

Requester: CELLIOSE S.A. / Division ARTILIN

Identification of the Material: 3A Mate

Process: LQAI.MC.77/12

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Requester: CELLIOSE SA / Division ARTILIN
Chemin de la Verrerie – BP 58
69492 PIERRE BENITE Cedex - Lyon
FRANCE

Process: LQAI.MC.77/12

Identification of the Material tested: 3A Mate

In response to a request from the company ‘CIN – Corporação Industrial do Norte’ a study was conducted on a sample, designated as ‘3A Mate’.

The sample was delivered at LQAI on 26/11/2012, and applied in a glass according to the instructions provided by the manufacturer. The application conditions were:

m (g)	A (m ²)
11.3	0.28

Where, m is the mass of the applied product and A is the glass area.

The emissions were monitored, from a test chamber, for 28 days of exposure, according to the norm ISO 16000-9¹. 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 according to the norm ISO 16000-6², on 18/08/2011. 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 16000-3³, 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 04/01/2013.

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

$T (^{\circ}\text{C})$	$HR (\%)$	$v (\text{m/s})$	$n (\text{h}^{-1})$	$A/V (\text{m}^2/\text{m}^3)$
22.1	52.5	0.13	0.54	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 0.255m^3 .

The aim of the study was to determine the quantity of emitted volatile organic compounds, formaldehyde, acetaldehyde and some CMR (carcinogenic, mutagenic and reprotoxic) substances, intending the material classification under the criteria established by the recent French legislation^{4,5}.

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 legislation⁴.

Table 1. Limit values established by the French legislation⁴ 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 (µg/m³)				MC.77/12 28 days
		Classes				
		C	B	A	A+	
formaldehyde	50-00-0	>120	<120	<60	<10	1.47
acetaldehyde	75-07-0	>400	<400	<300	<200	n.d.
toluene	108-88-3	>600	<600	<450	<300	n.d.
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.
COVsT		>2000	<2000	<1500	<1000	65.1

n.d. – not detected

Table 2 lists the concentration limits ($\mu\text{g}/\text{m}^3$) for CMR substances, imposed by the French legislation⁵ 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 2. Limit values established by the French legislation⁵ 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.56/11 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-ethyl-hexyl)ftalate (DEHP)	117-81-7	< $1 \mu\text{g}/\text{m}^3$	n.d.*
dibutylphthalate (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 stud, as stated by the manufacturer in the attached declaration.

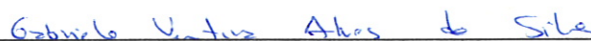
Discussion of the Results and Conclusions

The results presented in Table 1 and 2 show that the material is rated A+ 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 (2004). 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, 16 September 2013



Gabriela Ventura Alves da Silva
(Director of LQAI)



CIN - CORPORAÇÃO INDUSTRIAL DO NORTE, S.A.

CELLIOSE
COATINGS



Subject: Presence of Bis (2-ethylhexyl) phthalate (DEHP) substance in some paints

Entity: LQAI

For all due purposes it is declared that the paint 3A Mate, commercialized by the company Celliose / Division Artilin belonging to CIN Group, does not contain in its composition the Bis (2-ethylhexyl)phthalate (DEHP) substance.

Maia, September 13th, 2013

João Machado

(Technical Director)

(Processed by computer. Scanned signature with knowledge and authorization of the author.)