

Fraunhofer-Institut für Bauphysik IBP

Forschung, Entwicklung,
Demonstration und Beratung auf
den Gebieten der Bauphysik

Zulassung neuer Baustoffe,
Bauteile und Bauarten

Bauaufsichtlich anerkannte Stelle für
Prüfung, Überwachung und Zertifizierung

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Test Report HoE-004k/2012/281k (translation)

(Correction of Test Report HoE-004/2012/281)

Study of primer coat „Multigips Betonkontakt“ on the emission of volatile organic compounds

Conducted by order of

VG-ORTH GmbH & Co.KG
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Holeburgweg 24
37627 Stadtoldendorf

Holzkirchen, 12th June 2012

Pages 2 and 7 of HoE-004/2012/281 dated May 25, 2012
are replaced by pages 2k and 7k

1 Examined material

1.1 General data

Internal E-no.: E1788-1
Manufacturer: VG-ORTH GmbH & Co.KG
Holeburgweg 24
37627 Stadtoldendorf
Product name: Multigips Betonkontakt
corresponds to „Casonic Betonkontakt“
(according to the letter of the manufacturer of 2012/05/31)
General description: Primer coat on a plastic dispersion basis
Article no.: 744
Manufacturing date: 2012/02/20
Substrate: Glass plate

A plastic container (5 kg) packed in a paperboard container was sent by the client by parcel service (DHL) on February 24, 2012 (Figure 1). The primer coat is manufactured under serial production. At delivery date the product age of the sample was 4 days. Material and packaging were undamaged at the time of delivery. The closed plastic container was stored over a period of 31 days until the test specimens were produced.



Figure 1:
Sample material.



1.2 Description of examined material

The product to be examined is a primer coat on a plastic dispersion basis to improve adhesion of the plaster on glazed plaster substrates in indoor and outdoor areas.

Density: approx. 1.3 kg/litre

2 Procedure

2.1 Preparation of test specimens

The packaging was opened on March 3, 2012, and two satin finish glass plates (40 cm x 60 cm) were coated with the primer coat. The wet weight applied was 73 g and 71 g. (= approx. 300 g/m²). Then the two plates were placed in a test chamber to dry over a period of 24 hours. The two plates were taken from the test chamber on March 27, 2012 and brought to another test chamber for emission measurements. The free emitting surface of the two test specimens was 0.48 m² (2 x 40 cm x 60 cm) (Figure 2).



Figure 2:
Test specimens in the 230L emission test chamber.

2.2 Testing

The test specimens were examined by a 28-day emission test chamber experiment according to [2] on the basis of the AgBB evaluation scheme 2010 [1]. Table 1 represents the boundary condition of the emission test chamber experiment. Table 2 represents the parameters of sampling and the analysis methods applied [3], [4]. Break-off criteria were not applied.

Table 1:
Boundary conditions of testing.

Parameter	Explanation	Value
Test chamber	material	Stainless steel
	volume	230 NL
	manufacturer	IBP
System blank values of the test chamber including the glass plate	Individual substance > 2µg/m ³ [number]	3
	TVOC value C ₆ to C ₁₆ [µg/m ³]	17



Parameter	Explanation	Value
Temperature	equilibrated test chamber [°C]	23.0
	during testing [°C]	23 ± 1
Relative humidity	equilibrated test chamber [%]	50
	during testing [%]	50 ± 5
Ventilation rate	equilibrated test chamber [m ³ /h]	0.23
	during testing [m ³ /h]	0.23
Area-related ventilation rate	during testing [m ³ /(m ² · h)]	0.48
Inflow velocity at the test specimen	during testing [m/s]	0.1 to 0.3
Clean air system	Compressed air cleaned by activated coal and particle filter	

Table 2:
Sampling and analytical procedures.

Substance group	Time of sampling [d] ¹⁾	Sample volume [nl]	Duration of sampling [h]	Adsorbent	Analysis method
VOC	3, 7, 28	2,0 5,0	0,33 0,83	Adsorption tube according to requirement Tenax TA [®]	Thermo-desorption, GC-MS ²⁾
aldehyde & ketone	3, 7, 28	60	1,0	DNPH cartouche "DNPH Silica" (company of Waters)	HPLC-DAD ³⁾

- 1) time after the beginning of testing
- 2) Qualitative and quantitative analysis by means of GC-MS according to IBP – SAA 282/070, calibration by liquid doping of standards for Tenax TA[™] and separate GC injector, gas chromatograph (HP 6890) suited to be operated by capillary columns and thermo-desorber coupling (signal-to-noise ratio of 5:1 for 1 ng Toluol) by mass selective detector (HP 5975), capillary column direct interface, silica capillary column (VF-5ms, 60 m x 0,32 mm I.D.).
- 3) Investigations are conducted on the basis of DNP hydrazone of the following compounds (according to IBP – SAA 282/072): formaldehyde, acetaldehyde, acrolein, acetone, propionaldehyde, butyraldehyde, 2-Butanon, crotonaldehyde, valeraldehyde, isovaleraldehyde, cyclohexanone, hexanal, methylisobutylketone, benzaldehyde, o-Tolualdehyde, m-Tolualdehyde, p-Tolualdehyde, 2.5-Dimethylbenzaldehyde. Quantification is performed by five-point-calibration functions of the DNP hydrazones in acetonitrile.

The emission test chamber experiment was conducted under realistic conditions of the room model (charge, temperature, air exchange). The influence of sinks, barriers or other effects occurring in real rooms can only be approximated by experiment. This has to be taken into consideration when evaluating the derived results.

3 Results

The measurement results are shown in Table 3.

Table 3:
Time-dependent, chemical-analytic measured values (mean values) of the measured substances.

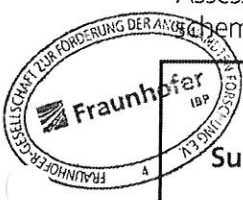
Compound	CAS-no.	RT [min]	Compound concentration in emission test chamber air [µg/m ³]			LCI [µg/m ³] ¹⁾
			3 d	7 d	28 d	
VVOC						
Formaldehyde ²⁾	50-00-0	2,3	9	7	3	-- ³⁾
VOC						
Acetic acid ⁴⁾	64-19-7	6,21	74	17	< LOQ ⁷⁾	500
2-Propenoic acid ⁵⁾	79-10-7	12,58	13	4	< LOQ ⁷⁾	-- ³⁾
1,2-Propanediol ⁴⁾	57-55-6	15,10	149	18	< LOQ ⁷⁾	2500
n-Octaldehyde ⁴⁾	124-13-0	27,34	1	< LOQ ⁷⁾	1	1100
2-Ethyl-1-hexanol ⁴⁾	104-76-7	28,20	15	4	< LOQ ⁷⁾	1100
n-Nonaldehyde ⁴⁾	124-19-6	30,95	2	< LOQ ⁷⁾	1	1300
2-Ethylhexylacetate ⁴⁾	103-09-3	32,17	18	3	< LOQ ⁷⁾	1400
? 1-Butoxy-2-ethylhexane ⁵⁾	-- ⁶⁾	33,85	1	< LOQ ⁷⁾	< LOQ ⁷⁾	-- ³⁾
n-Decaldehyde ⁴⁾	112-31-2	34,25	5	1	1	1400
Ester ⁵⁾	-- ⁶⁾	34,98	13	3	< LOQ ⁷⁾	-- ³⁾
Compound not identified (m/z 123, 141) ⁵⁾	-- ⁶⁾	35,48	1	< LOQ ⁷⁾	< LOQ ⁷⁾	-- ³⁾
Cyclodecane ⁵⁾	293-96-9	36,18	26	11	< LOQ ⁷⁾	-- ³⁾
Alcohol (? Dodecanol) ⁵⁾	10203-28-8	37,05	1	< LOQ ⁷⁾	< LOQ ⁷⁾	-- ³⁾
Ester ⁵⁾	-- ⁶⁾	37,48	5	2	< LOQ ⁷⁾	-- ³⁾
Ester ⁵⁾	-- ⁶⁾	38,85	9	5	< LOQ ⁷⁾	-- ³⁾
Ester ⁵⁾	-- ⁶⁾	39,38	12	8	< LOQ ⁷⁾	-- ³⁾
n-Tetradecane ⁴⁾	629-59-4	39,69	1	< LOQ ⁷⁾	< LOQ ⁷⁾	6000
Compound not identified (m/z 73, 112) ⁵⁾	-- ⁶⁾	40,96	1	< LOQ ⁷⁾	< LOQ ⁷⁾	-- ³⁾
? C15-isoalkane ⁴⁾	-- ⁶⁾	42,32	6	4	< LOQ ⁷⁾	6000
? Ester (m/z 57,85) ⁵⁾	-- ⁶⁾	42,87	12	10	2	-- ³⁾
2,2,4-Trimethyl-1,3-pentanediol diisobutyrate ⁴⁾	6846-50-0	44,77	10	10	4	450
Compound not identified (m/z 123, 184, 206) ⁵⁾	-- ⁶⁾	44,98	1	1	< LOQ ⁷⁾	-- ³⁾

- 1) LCI: Lowest concentration of interest, according to NIK-List 2010.
- 2) Identification and quantification by HPLC/DAD and reference compound.
- 3) No LCI determined.
- 4) Identification and quantification based on reference compound GC/MS.
- 5) Identification by GC/MS based on spectra library, quantification in toluene equivalents.
- 6) CAS-Nr. not available.
- 7) Chamber emission concentration below the limit of quantification (LOQ 0,6 µg/m³ in toluene equivalents).
- ? Uncertain identification based on mass spectra library.



The measurement results were assessed according to the AgBB evaluation scheme of 2010 [1]. The evaluation of the results and the calculation of the R-values are based on the NIK list of 2010 [1]. The sum assessment contains all single substance minimum concentration of $\geq 5 \mu\text{g}/\text{m}^3$ (Table 4).

Table 4:
Assessment of the primer coat „Multigips Betonkontakt“ according to the AgBB evaluation scheme.



Survey of results	3 days			28 days	
	result [$\mu\text{g}/\text{m}^3$]	requirement [mg/m^3]	Break-off criteria [mg/m^3]	result [$\mu\text{g}/\text{m}^3$]	requirement [mg/m^3]
TVOC ($C_6 - C_{16}$)	367	≤ 10	≤ 0.3	0	≤ 1.0
Sum SVOC ($C_{16} - C_{22}$)	0	none	≤ 0.03	0	≤ 0.1
Sum R_i [non-dimensional]	0,261	none	≤ 0.5	0	≤ 1
Sum VOC _{o. NIK}	90	none	≤ 0.05	0	≤ 0.1
Sum carcinogens	0	≤ 0.01	≤ 0.001	0	≤ 0.001
Sum VVOC	9	none	none	0	none
TVOC ($C_6 - C_{16}$) as toluol equivalent	205	none	none	0	none

In addition, the measurement results ($t = 28 \text{ d}$) were assessed according to the French VOC regulations [5]. The TVOC assessment comprises all substances with a single substance minimum concentration of $\geq 1 \mu\text{g}/\text{m}^3$ (Table 5).

Table 5:
Assessment of the primer coat „Multigips Betonkontakt“ according to the French VOC regulations.

Substance / sum value	Emission class [$\mu\text{g}/\text{m}^3$]				Result [$\mu\text{g}/\text{m}^3$]
	C	B	A	A+	
Formaldehyde	>120	<120	<60	<10	3
Acetaldehyde	>400	<400	<300	<200	< 1
Toluene	>600	<600	<450	<300	< 1
Tetrachlorethene	>500	<500	<350	<250	< 1
Xylol (Sum m-, p-, o-)	>400	<400	<300	<200	< 1
1,2,4-Trimethylbenzene	>2000	<2000	<1500	<1000	< 1
1,4-Dichloroenzene	>120	<120	<90	<60	< 1
Ethylbenzene	>1500	<1500	<1000	<750	< 1
2-Butoxyethanol	>2000	<2000	<1500	<1000	< 1
Styrene	>500	<500	<350	<250	< 1
TVOC	>2000	<2000	<1500	<1000	9



4 Summary

The following can be summarized:

- On the first, seventh and twenty-eighth day of the test chamber experiment no carcinogen substance could be detected by the investigation method applied according to the AgBB evaluation scheme.
- Emissions at VOC were below the limits defined by the AgBB evaluation scheme on the third and twenty-eighth day.
- The tested primer coat „Multigips Betonkontakt“ („Casonic Betonkontakt“) fulfills the requirements of the AgBB evaluation scheme for the application of building products in interiors.
- The tested primer coat „Multigips Betonkontakt“ („Casonic Betonkontakt“) complies with emission class A+ according to the French VOC regulations.

5 References

- [1] AgBB-Schema, Stand Mai 2010:
http://www.umweltbundesamt.de/bauprodukte/dokumente/AgBB-Bewertungsschema_2010.pdf
http://www.agbb-nik.de/index_en.php
- [2] DIN EN ISO 16000-9: Innenraumluftverunreinigungen - Teil 9: Bestimmung der Emission von flüchtigen organischen Verbindungen aus Bauprodukten und Einrichtungsgegenständen - Emissionsprüfkammer-Verfahren (ISO 16000-9:2008); Deutsche Fassung EN ISO 16000-9:2008
- [3] DIN ISO 16000-6: Innenraumluftverunreinigungen - Teil 6: Bestimmung von VOC in der Innenraumluft und in Prüfkammern, Probenahme auf TENAX TA®, thermische Desorption und Gaschromatographie mit MS/FID (ISO 16000-6:2004)
- [4] DIN ISO 16000-3: Innenraumluftverunreinigungen - Teil 3: Messen von Formaldehyd und anderen Carbonylverbindungen; Probenahme mit einer Pumpe (ISO 16000-3:2002)
- [5] Décret no 2011-321 du 23 mars 2011 et 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.

Remark:

The results are only valid for the tested samples and batch. After final evaluation the testing material is stored for 3 months at room temperature prior disposal.

The evaluation was conducted in the laboratory „Feuchte, Mörtel, Strahlung, Emissionen“, which has a flexible accreditation by DAkkS according DIN EN ISO/IEC 17025:2005, Nr. D-PL-11140-11-02.

This test report contains

8 pages of text,
5 tables and
2 figures.



Holzkirchen, 12th June 2012

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