ISEGA
Forschungs- und Untersuchungs-Gesellschaft mbH Aschaffenburg

Postfach 100565 . 63704 Aschaffenburg
Zeppelinstraße 3-5 . 63741 Aschaffenburg . Germany
Fon: +49 6021 4989-0 . Fax: +49 6021 4989-30
E-Mail: info@isega.de . www.isega.de

Aschaffenburg, 15 December 2022

From: Be-pf
Authorized by: Behrendt

REPORT

Order No.: 13934/43 **Page 1 of 10 pages**

Client: Progroup Board GmbH
Horstring 12
76829 Landau
Germany

Date of order: 18 July 2022

Receipt of sample material: 2 August 2022

Origin of sample material: From the client

Purpose: Analysis of board grades for their compliance with the demands on food contact materials

(Dr. Derra)
Managing Director

(Behrendt)
Officially certified and authorized food chemist

The present report exclusively refers to the samples mentioned. It meets the requirements of the DIN EN ISO/IEC 17025:2018 for simplified test reports. Additional information and statistical data on the results are available upon request.

DAkkS Deutsche Akkreditierungsstelle
D-PL-14160-01-01
D-PL-14160-01-02

Sample Material

For analysis the following sample material was in hand:

Sample 1:	1.02B N2
Sample 2:	1.03B W1
Sample 3:	1.10B N2
Sample 4:	1.22C X1
Sample 5:	1.24B Q7
Sample 6:	1.25E
Sample 7:	1.26B C2
Sample 8:	1.27E L2
Sample 9:	1.36B C2
Sample 10:	1.55B X6
Sample 11.	2.35BE
Sample 12:	2.50BC N2
Sample 13:	2.71BC N1
Sample 14:	2.90 BC
Sample 15:	2.92 AC
Sample 16:	3.90 AAC
Sample 17:	3.91 AAC
Sample 18:	3.92 AAC
Sample 19:	3.95 AAC
Sample 20:	3.96 AAC
Mixed sample 1:	Consisting of sample 1 - 10
Mixed sample 2:	Consisting of sample 11 - 20

Unless stated differently, the analysis was carried out on mixed samples.

Carrying out of the Tests

Examination period: 11 October 2022 to 24 November 2022

1. Determination of the Grammage *

The determination was performed according to DIN EN ISO 536:2012-11 after conditioning of the sample at 23 °C/50 % relative humidity which is prescribed as standard atmosphere with a reduced amount of test specimens.

Result:

Mixed sample 1:	382	g/m²	≙	359	g dry matter/m²
Mixed sample 2:	1118	g/m²	≙	1041	g dry matter/m²

2. Determination of the Moisture Content *

The determination was performed as single determination according to DIN EN ISO 638:2009-01 in the condition as received.

Result:

Mixed sample 1:	5.9	%
Mixed sample 2:	6.5	%

3. Preparation of Extracts *

The extracts were prepared according to the "Methodensammlung zur Untersuchung von Papier, Karton und Pappe für den Lebensmittelkontakt" (collection of methods for the examination of paper and board for food contact) of the BfR as well as according to DIN EN 645:1994-01, 647:1994-01 and 15519:2008-01. The selection of suitable procedures for simulating the transfer of substances was performed according to the corresponding BfR guideline ("Leitfaden zur Überprüfung der Stoffübergänge von Bedarfsgegenständen aus Papier, Karton und Pappe").

Water: 24 hours at 23 °C

4. Determination of Methanal (Formaldehyde) in the Water Extract *

The determination was performed according to DIN EN 1541:2001-07 photometrically in line with the acetylacetone method.

Result:

Mixed sample 1:	not quantifiable	<	0.004	mg/g
Mixed sample 2:	not quantifiable	<	0.004	mg/g

5. Determination of the Heavy Metals in Packagings *

The determination was performed after microwave disintegration by means of AAS or ICP-OES. It applies to those metals which are restricted according to the European Packaging Directive 94/62/EC as well as to the US American CONEG legislation.

Result:

Mixed sample 1:

Lead	(Pb):			5.5	mg/kg dry matter
Cadmium	(Cd):	not quantifiable	<	0.5	mg/kg dry matter
Mercury	(Hg):	not quantifiable	<	0.25	mg/kg dry matter
Chromium	(Cr):			4.0	mg/kg dry matter

Mixed sample 2:

Lead	(Pb):	not quantifiable	<	5	mg/kg dry matter
Cadmium	(Cd):	not quantifiable	<	0.5	mg/kg dry matter
Mercury	(Hg):	not quantifiable	<	0.25	mg/kg dry matter
Chromium	(Cr):			3.4	mg/kg dry matter

Limit value 100 mg/kg (sum of Pb, Cd, Hg and Cr(VI)).

Comment:

Under the disintegration conditions the total content of chromium including chromium(VI) is detected.

6. Determination of the Transfer of Antimicrobial Constituents *

The determination was made according to DIN EN 1104:2019-01. Test specimens of a diameter of 10 mm were placed onto an inoculated nutrient medium and then incubated. The inhibition zone is indicated as total diameter (including the test specimen).

Result:

Mixed sample 1:

with *Aspergillus niger*: Microbial growth up to the edges of the test specimens.
Presence of a microbial contaminant of < 2 mm around the test pieces.

with *Bacillus subtilis*: Microbial growth up to the edges of the test specimens.
Presence of a microbial contaminant of < 2 mm around the test pieces.

Mixed sample 2:

with *Aspergillus niger*: Microbial growth up to the edges of the test specimens.

with *Bacillus subtilis*: Microbial growth up to the edges of the test specimens.
Presence of a microbial contaminant of < 2 mm around the test pieces.

Comment:

The proof of the presence of an inhibition zone is provided by the absence of test microorganism growth in a minimum diameter of 14 mm.

Therefore, a transfer of antimicrobial constituents is considered as not detected.

7. Determination of Phthalates *

The determination was performed according to SOP 160.200 by means of GCMS in an acetone extract. The following compounds were considered:

Dimethyl phthalate	(DMP)	[131-11-3]
Diethyl phthalate	(DEP)	[84-66-2]
Diisobutyl phthalate	(DIBP)	[84-69-5]
Dibutyl phthalate	(DBP)	[84-74-2]
Di(2-ethylhexyl) phthalate	(DEHP)	[117-81-7]
Di-n-octyl phthalate	(DOP)	[117-84-0]
Benzylbutyl phthalate	(BBP)	[85-68-7]
Diisononyl phthalate	(DINP)	[68515-48-0]
Diisodecyl phthalate	(DIDP)	[26761-40-0]

Limit of quantitation: 1 mg/kg dry matter

Result:

Mixed sample 1:

Diisobutyl phthalate	2.4	mg/kg dry matter
Dibutyl phthalate	3.3	mg/kg dry matter
Di(2-ethylhexyl) phthalate	9.7	mg/kg dry matter

Mixed sample 2:

Diisobutyl phthalate	1.4	mg/kg dry matter
Dibutyl phthalate	2.4	mg/kg dry matter
Di(2-ethylhexyl) phthalate	8.2	mg/kg dry matter

The remaining compounds were not quantifiable.

8. Determination of o-Phenylphenol [90-43-7] in the Water Extract *

The determination was performed according to SOP 162.200 by means of HPLC-UV.

Result:

Mixed sample 1:	not determinable	<	0.7 [1)]	mg/kg dry matter
Mixed sample 2:	not determinable	<	0.7 [1)]	mg/kg dry matter

[1)] The determination limit was raised due to matrix effects.

9. Determination of Polycyclic Aromatic Hydrocarbons (PAH) *

The determination was performed according to the draft standard by means of GCMS. The following compounds were considered:

Naphthalene	[91-20-3]	Benzo[b]naphtho[1,2-d]thiophene	[205-43-6]
2-Methyl naphthalene	[91-57-6]	Benzo[a]anthracene	[56-55-3]
1-Methyl naphthalene	[90-12-0]	Triphenylene/Chrysene	[217-59-4]/[218-01-9]
Acenaphthylene	[208-96-8]	Benzo[b]fluoranthene	[205-99-2]
Acenaphthene	[83-32-9]	Benzo[k]fluoranthene	[207-08-9]
Fluorene	[86-73-7]	Benzo[e]pyrene	[192-97-2]
Phenanthrene	[85-01-8]	Benzo[a]pyrene	[50-32-8]
Anthracene	[120-12-7]	Perylene	[198-55-0]
2-Methyl phenanthrene	[2531-84-2]	Indeno[1,2,3-cd]pyrene	[193-39-5]
Fluoranthene	[206-44-0]	Dibenzo[a,h]anthracene	[53-70-3]
Pyrene	[129-00-0]	Benzo[g,h,i]perylene	[191-24-2]
Benzo[c]phenanthrene	[195-19-7]		

Limits of quantitation:
Acenapthylene, Fluorene, Fluoranthene, Triphenylene/Chrysene 0.03 mg/kg dry matter;
all other compounds 0.02 mg/kg dry matter.

Result:

Mixed sample 1:

Phenanthrene	0.039	mg/kg dry matter
Fluoranthene	0.039	mg/kg dry matter
Pyrene	0.041	mg/kg dry matter

Mixed sample 2:

Phenanthrene	0.029	mg/kg dry matter
Fluoranthene	0.030	mg/kg dry matter
Pyrene	0.032	mg/kg dry matter

Further compounds listed above were not quantifiable.

10. Determination of the pH value *

The determination was performed according to ISO 6588 from a cold water extract.

Result:

Mixed sample 1:	7.6
Mixed sample 2:	7.7

11. Determination of the Specific Migration into Tenax® (Modified Polyphenylene Oxide) *

The migration was performed as a single fold determination according to DIN EN 14338:2004-03.

Conditions A:	10 days at 40 °C
Conditions B:	30 days at 40 °C

Testing procedure: one-sided contact

Subsequently, the volatile components adsorbed onto Tenax were extracted.

11.1. Gas chromatographic Analysis

The determination was performed according to SOP 160.200 by means of GCMS after extraction with methyl *tert*-butylether.

a) Sum of the volatile components

The volatile components were summarized semi-quantitatively using deuterated nonadecane as internal standard.

Result:

Conditions A:

Sample 9:	1.3	mg/dm²
Sample 10:	0.9	mg/dm²
Sample 19:	0.9	mg/dm²
Sample 20:	0.7	mg/dm²

b) Specific Evaluation

In addition, an examination for the below listed contaminants was performed.

Result:

Conditions A:

Sample 9 + 10 + 19 + 20:

Diisopropylnaphthalene (DIPN)	[38640-62-9]	not quantifiable	<	0.05	mg/dm²
Other solvent		not quantifiable	<	0.05	mg/dm²
Benzophenone	[119-61-9]	not quantifiable	<	0.02	mg/dm²
4-Methyl benzophenone	[134-84-9]	not quantifiable	<	0.02	mg/dm²
Dimethyl phthalate	[131-11-3]	not quantifiable	<	0.05	mg/dm²
Diethyl phthalate	[84-66-2]	not quantifiable	<	0.05	mg/dm²
Dibutyl phthalate	[84-74-2]	not quantifiable	<	0.02	mg/dm²
Diisobutyl phthalate	[84-69-5]	not quantifiable	<	0.02	mg/dm²
Di(2-ethylhexyl) phthalate	[117-81-7]	not quantifiable	<	0.05	mg/dm²
Di-n-octyl phthalate	[117-84-0]	not quantifiable	<	0.05	mg/dm²
Benzylbutyl phthalate	[85-68-7]	not quantifiable	<	0.05	mg/dm²
Diisononyl phthalate	[68515-48-0]	not quantifiable	<	0.15	mg/dm²
Diisodecyl phthalate	[26761-40-0]	not quantifiable	<	0.20	mg/dm²
Di-(2-ethylhexyl) adipate	[103-23-1]	not quantifiable	<	0.05	mg/dm²
2,2,4-Trimethyl-1,3-pentanediol diisobutyrate (TXIB)	[6846-50-0]	not quantifiable	<	0.02	mg/dm²
Diisononyl-1,2-cyclohexane-dicarboxylate (DINCH)	[166412-78-8]	not quantifiable	<	0.15	mg/dm²
Diethylene glycol dibenzoate	[120-55-8]	not quantifiable	<	0.002	mg/dm²
Benzyl-2-naphthylether	[613-62-7]	not quantifiable	<	0.002	mg/dm²

11.2. Mineral Oil (MOSH/MOAH) *

The determination was performed according to the DIN SPEC 5010:2018-05 after extraction with n-hexane.

The paraffinic, naphthenic mineral oil hydrocarbons (MOSH) and the aromatic mineral oil hydrocarbons (MOAH) were examined according to the method published by the German "National Reference Laboratory for Materials in contact with food" by means of on-line coupled HPLC-GC-FID.

Conditions B:

Result:	MOSH			MOAH		
	≥ C_{10} - ≤ C_{16}	> C_{16} - ≤ C_{20}	> C_{20} - ≤ C_{35}	≥ C_{10} - ≤ C_{16}	> C_{16} - ≤ C_{35}	
Sample 9:	0.07	0.38	0.53	< 0.02	0.1	mg/dm²
Sample 10:	0.04	0.47	0.47	< 0.02	0.08	mg/dm²
Sample 19:	0.07	0.36	0.41	< 0.02	0.06	mg/dm²
Sample 20:	0.07	0.3	0.41	< 0.02	0.05	mg/dm²

12. Determination of Vinylchloride [75-01-4] *

The determination was performed according to SOP 160.200 by means of HeadspaceGC-MS.

Result:

Mixed sample 1:	not quantifiable	<	0.5	mg/kg
Mixed sample 2:	not quantifiable	<	0.5	mg/kg

13. Determination of Vinylidene Chloride [75-35-4] *

The determination was performed according to SOP 160.200 by means of Headspace-GCMS.

Result:

Mixed sample 1:	not quantifiable	<	0.5	mg/kg
Mixed sample 2:	not quantifiable	<	0.5	mg/kg

14. Determination of Per- and Polyfluoro Alkyl Substances (PFAS)

The determination was performed according to SOP 162.200 by means of LCMS in a methanol extract. The following compounds were considered:

Perfluoro alkyl acids:

- butanoic	(PFBA)	[375-22-4]
- pentanoic	(PFPeA)	[2706-90-3]
- hexanoic	(PFHxA)	[307-24-4]
- heptanoic	(PFHpA)	[375-85-9]
- octanoic	(PFOA)	[335-67-1]
- nonanoic	(PFNA)	[375-95-1]
- decanoic	(PFDA)	[335-76-2]
- undecanoic	(PFUnDA)	[2058-94-8]
- dodecanic	(PFDoDA)	[307-55-1]
- tridecanoic	(PFTrDA)	[72629-94-8]
- tetradecanoic	(PFTeDA)	[376-06-7]
- hexadecanoic	(PFHxDA)	[67905-19-5]
- octadecanoic	(PFOcDA)	[16517-11-6]

Perfluoro alkyl sulfonic acids:

- butane sulfonic	(PFBS)	[375-73-5]
- pentane sulfonic	(PFPeS)	[2706-91-4]
- hexane sulfonic	(PFHxS)	[355-46-4]
- heptane sulfonic	(PFHpS)	[375-92-8]
- octane sulfonic	(PFOS)	[1763-23-1]
- nonane sulfonic	(PFNS)	[68259-12-1]
- decane sulfonic	(PFDS)	[335-77-3]
- undecane sulfonic	(PFUnDS)	[749786-16-1]
- dodecane sulfonic	(PFDoS)	[79780-39-5]
- tridecane sulfonic	(PFTrDS)	[791563-89-8]
H4-Polyfluoro octane sulfonic acid	(H4PFOS)	[27619-97-2]
Perfluorooctane sulfonamide	(PFOSA)	[754-91-6]

Limit of quantitation: 0.01 mg/kg

Result:

Mixed sample 1 + 2:

None of the above-listed compounds were quantifiable.

15. Determination of Bisphenol A [80-05-7] and Bisphenol S [80-09-1] in the Water Extract *

The determination was performed according to SOP 162.200 by means of HPLC-fluorescence or HPLC-UV.

Result:

Mixed sample 1:

Bisphenol A	0.017	mg/l extract
Bisphenol S	0.14	mg/l extract

Mixed sample 2:

Bisphenol A	0.014	mg/l extract
Bisphenol S	0.15	mg/l extract

16. Determination of Recycling Contaminants

The determination was performed according to SOP 162.200 by means of LCMS in an acetonitrile extract. The following compounds were considered:

Benzophenone	[119-61-9]
2-Methylbenzophenone	[131-58-8]
3-Methylbenzophenone / 4-Methylbenzophenone	[643-65-2] / [134-84-9]
2-Hydroxybenzophenone	[117-99-7]
4-Hydroxybenzophenone	[1137-42-4]
4,4'-Bis(dimethylamino)-benzophenone (Michler's ketone)	[90-94-8]
4,4'-Bis(diethylamino)-benzophenone (DEAB)	[90-93-7]
Bisphenol A	[80-05-7]
Bisphenol S	[80-09-1]
Bisphenol B	[77-40-7]
Bisphenol F	[620-92-8]
N-(p-toluenesulfonyl)-N'-(3-(p-toluene-sulfonyloxy)phenyl) (Pergafast 201)	[232938-43-1]
m-Aminophenol p-toluenesulfonate (m-Aminophenyl tosylate)	[3865-15-4]
N-(Methoxycarbonyl)-p-toluenesulfonamide (Methyl tosylcarbamate)	[14437-03-7]
2-Ethylhexyl 4-dimethylaminobenzoate (EHDAB)	[21245-02-3]
Ethyl 4-dimethylaminobenzoate (EDAB)	[10287-53-3]
2-Isopropylthioxanthone (ITX)	[5495-84-1]
4-Diethylaminobenzaldehyde	[120-21-8]

Limit of quantitation: [1] 0.1 mg/kg

Result:

Mixed sample 1:

Benzophenone	1.5	mg/kg
Bisphenol A	0.81	mg/kg
Bisphenol S	0.71	mg/kg
4,4'-Bis(diethylamino)-benzophenone (DEAB)	0.14	mg/kg
3-Methylbenzophenone / 4-Methylbenzophenone	0.26	mg/kg
4,4'-Bis(dimethylamino)-benzophenone (Michler's ketone)	0.17	mg/kg
N-(p-toluenesulfonyl)-N'-(3-(p-toluene-sulfonyloxy)phenyl) (Pergafast 201)	0.21	mg/kg
2-Isopropylthioxanthone (ITX)	0.22	mg/kg

Mixed sample 2:

Benzophenone	0.90	mg/kg
Bisphenol A	0.51	mg/kg
Bisphenol S	0.43	mg/kg
3-Methylbenzophenone / 4-Methylbenzophenone	0.12	mg/kg
4,4'-Bis(dimethylamino)-benzophenone (Michler's ketone)	0.12	mg/kg
N-(p-toluenesulfonyl)-N'-(3-(p-toluene-sulfonyloxy)phenyl) (Pergafast 201)	0.11	mg/kg
2-Isopropylthioxanthone (ITX)	0.11	mg/kg

Further compounds listed above were not quantifiable.

17. Determination of Polybromated Diphenylethers (PBDE) and Polybromated Biphenyls (PBB)

The determination was performed in collaboration with ARGUK-Umweltlabor GmbH, Oberursel/ Germany by means of GC-ECD or GCMS in an acetone extract. The following compounds were considered:

Tetrabromo diphenylether (TeBDE)
Pentabromo diphenylether (Σ PeBDE – 85, 99, 100)
Hexabromo diphenylether (HxBDE)
Heptabromo diphenylether (HeBDE)
Octabromo diphenylether (Σ OBDE – 196, 197, 203)
Nonabromo diphenylether (NBDE)
Decabromo diphenylether (DBDE)

Hexabromo biphenyl (HxBB)
Octabromo biphenyl (OBB)
Decabromo biphenyl (DBB)

Limit of quantitation: PBDE 10 mg/kg ; PBE 1 mg/kg

Result:

Mixed sample 1 + 2:

None of the above-listed compounds were quantifiable.

The accreditation applies to the methods marked with * in the test report (Register no. D-PL-14160-01-01 and D-PL-14160-01-02). End of report