

třída Tomáše Bati 299, Louky, 763 02 Zlín, Czech Republic

Testing Laboratory No. 1004

accredited by ČIA according to ČSN EN ISO/IEC 17025:2018



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ACCREDITED LABORATORY TEST REPORT ref. No. 472114674-01

Client:

rPET InWaste, s.r.o.

ID: 03212025

Address:

Preslova 307/73, Pisárky, 602 00 Brno, Czech Republic

Sample:

PRCT_L_bottle 100% rPET

Sample received on:

October 7, 2021

Report elaborated by:

Dipl. Ing. Šárka Kopečková

Place and date of issue:

Zlín, November 15, 2021



Dipl. Ing. Jiří Samsonek, Ph.D. Head of Accredited Testing Laboratory



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Sample description and identification:

Table I - Sample description and identification

ITC's number	Sample identification by client	Description of submitted sample
14674/1	PRCT_L_bottle 100% rPET	Smoke green transparent plastic bottle – see the figure No. 1

The submitted sample is shown in the following figure No. 1:

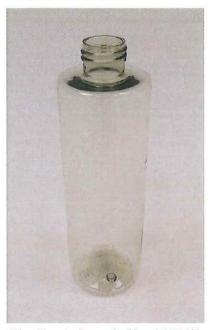


Fig. No. 1: Sample No. 14674/1

Sampling method used:

The test sample was collected and supplied to the laboratory by the client. The laboratory is not responsible for this way of sampling.

Work requested:

- Evaluation of the selected hygienic properties of a product according to Decree of Health Ministry No. 38/2001 Coll. for articles intended into a contact with foodstuffs, as amended, in compliance with Law of Czech Republic No. 258/2000 Coll. about protection of the public health, as amended. The evaluation of hygienic properties of the sample is based on European legislation in the sense of
 - Regulation (EC) No. 1935/2004 of the European Parliament and of the Council on materials and articles intended to come into contact with food, according to Commission Regulation EU No. 10/2011 on plastic materials and articles intended to come into contact with food, as amended.
- 2. Determination of polycyclic aromatic hydrocarbons (PAH) in the mass of the sample.
- 3. Semi-quantitative analysis of NIAS (non-intentionally added substances) after migration into 95% ethanol.

Testing method used:

- 1. Overall migration into food simulants A (10% ethanol), B (3% acetic acid) and D2 (olive oil) according to ČSN EN 1186-3 and ČSN EN 1186-2.
- 2. Specific migration of acetaldehyde into food simulants by UFLC method according to IZP A-12-102
- 3. Specific migration of terephthalic acid and isophthalic acid into food simulants using UFLC method according to IZP A-96-35

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- Specific migration of ethyleneglycol and diethyleneglycol into food simulants using GC-TCD method according to IZP A-12-103
- 5. Specific migration of metals into 3% acetic acid by ICP-MS according to IZP A-10-97
- Specific migration of primary aromatic amines into 3% acetic acid by LC-MS/MS method according to IZP A-95-28
- Determination of polycyclic aromatic hydrocarbons (PAH) by GC-MS method according to AfPS GS 2019:01 PAK, Annex: Testing instructions
- 8. Identification of low-molecular substances by Thermal Desorption Gas Chromatograph Mass Spectroscopy according to IZP A-07-71
- 9. Identification and semi-quantitative analysis of low-molecular substances in 95% ethanol by GC-MS method outside the scope of accreditation
- 10. XRF determination of toxic elements according to IZP A-98-09

Where internal test procedures (IZP) are specified in the test methods used, the annex to the Accreditation Certificate shall indicate for each internal procedure the links to the standards on which the internal test procedure is based.

Test conditions:

- ad 1 Simulants: A 10% ethanol, B 3% acetic acid and D2 olive oil Contact temperature and contact time: (40±2) °C / 10 days Migration ratio: 253 cm²/260 ml of simulant; filling of the sample
- ad 2 Simulants: A 10% ethanol, B 3% acetic acid
 Contact temperature and contact time: (60±2) °C / 10 days
 Substitute fatty simulant 95% ethanol
 Contact temperature and contact time: (20±2) °C / 10 days
 Migration ratio for all simulants: 236 cm²/270 ml of simulants file

Migration ratio for all simulants: 236 cm²/270 ml of simulant; filling of the sample The test results are expressed for the migration ratio: 6 dm²/ kg of food.

ad 3 Simulants: A – 10% ethanol, B – 3% acetic acid and substitute fatty simulant - isooctane Contact temperature and contact time: (60±2) °C / 10 days Substitute fatty simulant 95% ethanol Contact temperature and contact time: (20±2) °C / 10 days

Migration ratio for all simulants: 236 cm²/270 ml of simulant; filling of the sample The test results are expressed for the migration ratio: 6 dm²/ kg of food.

- ad 4 Simulants: A 10% ethanol, B 3% acetic acid and D2 olive oil

 Contact temperature and contact time: (60±2) °C / 10 days

 Migration ratio: 236 cm²/270 ml of simulant; filling of the sample

 The test results are expressed for the migration ratio: 6 dm²/ kg of food.
- ad 5,6 Simulant: B (3% acetic acid)
 Contact temperature and contact time: (60±2) °C / 10 days
 Migration ratio: 236 cm²/270 ml of simulant; filling of the sample
 The test results are expressed for the migration ratio: 6 dm²/ kg of food.
- ad 6 <u>LC-MS/MS method</u>: quantification of PAAs listed in entry 43 to Appendix 8 of Annex XVII to REACH (Regulation (EC) No. 1907/2006 of European Parliament and of Council), PAAs for which the specific migration limit in Annex I of Commission Regulation (EU) 10/2011 is stated; detection of presence of other 25 PAAs.
- ad 7 According to AfPS GS 2019:01 PAK, Annex: Testing instructions
- ad 8 The sample was thermally desorbed at 280°C for 4 minutes and the evolved substances were identified using GC-MS method by comparing the obtained mass spectra with mass spectra from D-base. Identified substances can be either original ones, presented in the sample, or it can be degradation products. Match of the MS spectra of found substances with standard MS spectra from D-base was in the range of 70-95 %.



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ad 9 Identification of substances in 95% ethanol after migration was done using GC-MS method by comparing the obtained mass spectra with mass spectra from D-base. Match of the MS spectra of found substances with standard MS spectra from D-base was in the range of 70-95 %.

The substances were semi-quantified using D-chrysene as an analytical standard for quantification by comparing height of peaks.

Migration conditions:

Contact temperature and contact time: 60 °C / 10 days

Migration ratio: 75 cm²/ 11 ml of 95% ethanol

Migration by total immersion

The test results were recalculated for the migration ratio: 6 dm²/ kg of food.

The measured values are expressed as mg of d-chrysene equivalent per kg of food for the migration ratio of 6 dm²/1 kg.

The laboratory is not responsible for information received from customer, which could have influence on the validity of the results. Further information required by the standard/standards and not given in this Test Report are available at a request at the Laboratory.

Testing laboratory:

Workplace no.: 1 - třída Tomáše Bati 299, Louky, 763 02 Zlín

Test results:

The test results are listed in the following tables:

Overall migration determination; 40 °C / 10 days

Table II: Sample No. 14674/1 - PRCT L bottle 100% rPET

	11-24	Value obtaine	d ¹⁾	Analytical	I !!4 3)
Food simulant	Unit	Single results	Average	tolerance 2)	Limit 3)
A: 10% ethanol	mg/dm²	<1.0; <1.0; <1.0	<1.0	1	_ 10
B: 3% acetic acid	mg/dm²	<1.0; <1.0; <1.0	<1.0	1	10
D2: olive oil	mg/dm²	<2.0; <2.0; <2.0	<2.0	3	10

Notes to the table V:

- Symbol "<" means less than LOQ (limit of quantification) of the analytical method.
- 2) Analytical tolerance according to ČSN EN 1186-1, article 12.3
- 3) Limit values according to Commission Regulation (EU) No 10/2011, as amended



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Determination of specific migration of monomers and additives

Table III: Sample No. 14674/1 - PRCT L bottle 100% rPET

Substance	Unit 1)	Value obtained ²⁾	Uncertainty	Limit 3)
Specific migration into	10% ethar	nol, (60±2) °C / 10 da	ys	
Terephthalic acid, Ref. No. 24910, CAS 100-21-0	mg/kg	< 0.5	i e	max. 7.5
Isophthalic acid, Ref. No. 19150, CAS 121-91-5	mg/kg	< 0.5	r u	max. 5
Acetaldehyde, Ref. No. 10060, CAS 75-07-0	mg/kg	<1	<u>-</u>	max. 6
Ethyleneglycol, Ref. No. 16990, CAS 107-21-1 and diethyleneglycol, Ref. No. 15760, CAS 111-46-6	mg/kg	< 20.1 4)	-	max. 30 ⁴⁾
Specific migration into	3% acetic a	acid, (60±2) °C / 10 d	ays	
Terephthalic acid, Ref. No. 24910, CAS 100-21-0	mg/kg	< 0.5	-	max. 7.5
Isophthalic acid, Ref. No. 19150, CAS 121-91-5	mg/kg	< 0.5	-	max. 5
Acetaldehyde, Ref. No. 10060, CAS 75-07-0	mg/kg	< 1	-	max. 6
Ethyleneglycol, Ref. No. 16990, CAS 107-21-1 and diethyleneglycol, Ref. No. 15760, CAS 111-46-6	mg/kg	< 20.1 4)	- a	max. 30 ⁴⁾
Specific migration in	ito olive oi	I, (60±2) °C / 10 days	3	
Ethyleneglycol, Ref. No. 16990, CAS 107-21-1 and diethyleneglycol, Ref. No. 15760, CAS 111-46-6	mg/kg	< 5.0 ⁴⁾	- 0	max. 30 ⁴⁾
Specific migration into	95% ethai	nol, (20±2) °C / 10 da	ays	
Terephthalic acid, Ref. No. 24910, CAS 100-21-0	mg/kg	< 0.5	=	max. 7.5
Isophthalic acid, Ref. No. 19150, CAS 121-91-5	mg/kg	< 0.5	-	max. 5
Acetaldehyde, Ref. No. 10060, CAS 75-07-0	mg/kg	<1	_	max. 6
Specific migration int	o isooctar	e, (60±2) °C / 10 day	/S	
Terephthalic acid, Ref. No. 24910, CAS 100-21-0	mg/kg	< 0.5	-	max. 7.5
Isophthalic acid, Ref. No. 19150, CAS 121-91-5	mg/kg	< 0.5	-	max. 5

Notes to the table III:

1) Expressed as mg of substance per kg of food simulant.

2) Symbol "<" means LOD (limit of detection) of the analytical method.

3) The limit values according to Decree of Health Ministry No. 38/2001 Coll., as amended and according to Commission Regulation (EU) No 10/2011, as amended

The sum of these substances expressed as ethyleneglycol



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Specific migration of metals according to Commission Regulation (EU) No 10/2011, Annex II

Table IV: Sample No. 14674/1 - PRCT L bottle 100% rPET

Element	Unit	Test result 1)	Uncertainty	Limit 2)				
Specific migration into 3% acetic acid, (60±2) °C / 10 days								
Aluminium Al	mg/kg	< 0.10	-	max. 1				
Barium Ba	mg/kg	< 0.05	-	max.1				
Cobalt Co	mg/kg	< 0.005	-	max. 0.05				
Copper Cu	mg/kg	< 0.10		max. 5				
Iron Fe	mg/kg	< 0.50	-	max. 48				
Lithium Li	mg/kg	< 0.01	-	max. 0.6				
Manganese Mn	mg/kg	< 0.05	-	max. 0.6				
Nickel Ni	mg/kg	< 0.01	8.5	max. 0.02				
Antimony Sb	mg/kg	< 0.005	9 	max. 0.04				
Zinc Zn	mg/kg	< 0.10	1.	max. 5				
Europium Eu	mg/kg	< 0.001	7-	max. 0.05				
Gadolinium Gd	mg/kg	< 0.001	-	max. 0.05				
Lanthanum La	mg/kg	< 0.001	-	max. 0.05				
Terbium Tb	mg/kg	< 0.001	-	max. 0.05				
Sum of Lanthanides	mg/kg	< 0.004	-	max. 0.05				
Arsenic As	mg/kg	< 0.001	-	N.D. (0.01)				
Cadmium Cd	mg/kg	< 0.001	-	N.D. (0.002)				
Chromium Cr	mg/kg	< 0.01	-	N.D. (0.01)				
Lead Pb	mg/kg	< 0.005	-	N.D. (0.01)				
Mercury Hg	mg/kg	< 0.002	-	N.D. (0.01)				

Notes to the table IV:

Symbol "<" means less than limit of detection of the analytical method. Expressed as mg of the element per kg of food simulant

2) Limit values according to Commission Regulation (EU) 10/2011 as amended

N.D. = not detectable; for limit of detection see the value in brackets



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Test result of specific migration of primary aromatic amines (PAAs) - Annex II (10/2011);

Table V: Sample No. 14674/1 - PRCT L bottle 100% rPET

Food simulant 3% acetic acid, 60°C / 10 days

	1	r	THE RESERVE OF THE PERSON NAMED IN	T		
Primary aromatic amine (PAA)	CAS No.	Unit 1)	Test result 2)	Uncertainty	Limit 3)	
PAAs listed in entry 43	to Append	lix 8 of A	nnex XVII to REA	CH		
4-Amino-biphenyle	92-67-1	mg/kg	< 0.002	-	N.D.	
Benzidine	92-87-5	mg/kg	< 0.002	-	N.D.	
4-Chlor-o-toluidine	95-69-2	mg/kg	< 0.002	H ÷	N.D.	
2-Naphthylamine	91-59-8	mg/kg	< 0.002	H .x	N.D.	
o-Aminoazotoluene	97-56-3	mg/kg	< 0.002	-	N.D.	
2-Amino-4-nitro-toluene	99-55-8	mg/kg	< 0.002	=.:	N.D.	
p-Chlor -aniline	106-47-8	mg/kg	< 0.002	-	N.D.	
2,4-Diamino-anisole	615-05-4	mg/kg	< 0.002		N.D.	
4,4'-Diamino-diphenylmethane	101-77-9	mg/kg	< 0.002	-	N.D.	
3,3'-Dichlor-benzidine	91-94-1	mg/kg	< 0.002	-	N.D.	
3,3'-Dimethoxy-benzidine	119-90-4	mg/kg	< 0.002	_	N.D.	
3,3'-Dimethyl-benzidine	119-93-7	mg/kg	< 0.002	-	N.D.	
3,3'-Dimethyl-4,4'-diaminodiphenylmethane	838-88-0	mg/kg	< 0.002	-	N.D.	
p-Keresidine	120-71-8	mg/kg	< 0.002		N.D.	
4,4'-Methylen-bis(2-chloraniline)	101-14-4	mg/kg	< 0.002	-	N.D.	
4,4'-Oxy-dianiline	101-80-4	mg/kg	< 0.002	=	N.D.	
4,4'-Thio-dianiline	139-65-1	mg/kg	< 0.002	-	N.D.	
o-Toluidine	95-53-4	mg/kg	< 0.002	_	N.D.	
2,4-Toluenediamine	95-80-7	mg/kg	< 0.002		N.D.	
2,4,5-Trimethyl-aniline	137-17-7	mg/kg	< 0.002		N.D.	
o-Anisidine	90-04-0	mg/kg	< 0.002	-	N.D.	
o-Aminoazobenzene	60-09-3	mg/kg	< 0.002	_	N.D.	
Other P.	AAs (not lis	sted in RE	ACH)			
Screening for others	4)	-	No P	No PAA detected 5)		
Sum of detected PAAs		mg/kg	-	_	max. 0.0	

Notes to the table V:

1) Expressed as mg of the substance per kg of food simulant

2) Symbol "<" means less than limit of detection of the analytical method

3) Limit values according to Commission Regulation EU 10/2011 as amended

4) These PAAs were screened – CAS No. 95-68-1, CAS No. 87-62-7, CAS No. 2243-62-1, CAS No. 62-53-3, CAS No. 95-51-2, CAS No. 108-42-9, CAS No. 106-49-0, CAS No. 106-50-3, CAS No. 823-40-5, CAS No. 121-69-7, CAS No. 6582-52-1, CAS No. 1208-52-2, CAS No. 6358-64-1, CAS No. 95-82-9, CAS No. 94-70-2, CAS No. 2835-68-9, CAS No. 81-16-3, CAS No. 88-44-8, CAS No. 49564-57-0, CAS No. 95-23-8, CAS No. 132-32-1, CAS No. 95-54-5, CAS No. 67014-36-2, CAS No. 156-43-4, CAS No. 90-41-5

5) LOD (limit of detection) of individual PAA is 0,005 mg/kg

REACH = Regulation (EC) No. 1907/2006 of European Parliament and of Council

N.D. = not detectable; limit of detection 0,002 mg/kg

Note: The results given in this Test Report apply only to the sample tested by our laboratory!
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Test result of specific migration of primary aromatic amines (PAAs) - Annex I (10/2011)

Table VI: Sample No. 14674/1 - PRCT L bottle 100% rPET

Food simulant 3% acetic acid, 60°C / 10 days

Primary aromatic amine	CAS No.	Unit 1)	Test result 2)	Uncertainty	Limit 3)
Bis(4-aminophenyl)sulphone	80-08-0	mg/kg	< 0.005	-	max. 5
2-Aminobenzamide	88-68-6	mg/kg	< 0.005	-	max. 0.05
1,3-Phenylenediamine	108-45-2	mg/kg	< 0.002	-	max. 0.002
4,4'-Methylenebis(3-chloro-2,6-diethylaniline)	106246-33-7	mg/kg	< 0.005	-	max. 0.05

Notes to the table VI:

- 1) Expressed as mg of substance per kg of food simulant.
- 2) Symbol "<"means less than limit of detection of the analytical method.
- 3) Limit values according to Commission Regulation (EU) No 10/2011; Annex I

Determination of polyaromatic hydrocarbons in the mass

Table VII: Sample No. 14674/1 - PRCT L bottle 100% rPET

Substance	Unit	Value obtained 1)	Uncertainty
Naphthalene	mg/kg	< 0.20	-
Phenanthrene	mg/kg	< 0.20	-
Anthracene	mg/kg	< 0.20	-
Fluoranthene	mg/kg	< 0.20	-
Pyrene	mg/kg	< 0.20	<u></u>
Chrysene	mg/kg	< 0.20	-1:
Benzo(a)anthracene	mg/kg	< 0.20	<u> </u>
Benzo(b+j)fluoranthene	mg/kg	< 0.40	
Benzo(k)fluoranthene	mg/kg	< 0.20	-
Benzo(e)pyrene	mg/kg	< 0.20	2 "
Benzo(a)pyrene	mg/kg	< 0.20	-2
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.20	# ·
Dibenz(a,h)anthracene	mg/kg	< 0.20	= 0
Benzo(g,h,i)perylene	mg/kg	< 0.20	
Sum PAHs	mg/kg	-	₩

Notes to the table VII:

¹⁾ Symbol ,,<" means less than LOD (limit of detection) of the analytical method.



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Toxic elements determination

Table VIII: Sample No. 14674/1 - PRCT L bottle 100% rPET

Parameter	Unit	Test result 1)	Uncertainty 2)	Limit
Pb	mg/kg	< 10	_	3)
Cd	mg/kg	< 10	-	3)
Hg	mg/kg	< 10	_	3)
Cr (total)	mg/kg	< 10	-	
Cr VI	mg/kg	< 10 4)	-	3)
Sb	mg/kg	< 20	_	3)
As	mg/kg	< 10	-	3)
Se	mg/kg	< 10	-	3)

Notes to the table VIII:

- 1) Symbol "<" means less than LOD (limit of detection) of the analytical method.
- 2) Uncertainty of the type B, i.e. 10% rel. from the test result value
- ³⁾ According to Decree of Health Ministry No. 38/2001 Coll., for articles intended into a contact with foodstuffs, as amended: pigments and fillers must not contain compounds based on these elements: Pb, Hg, Cd, Cr⁶⁺, Sb, Se and As.
- 4) The hexavalent chromium content was determined by calculation from the total chromium content.

Identification of low-molecular substances by method TD-GC-MS

Table IX: Sample No. 14674/1 - PRCT L bottle 100% rPET

Substance name ¹⁾	CAS	FCM	Comment
Fatty acids	-	12	Substance listed in Annex I with no SML
PET oligomers	-	1=	The better identification could not be done by the method used; natural parts of PET material

Notes to the table IX:

1) Identified substances can be either original ones, presented in the sample, or it can be degradation products. Match of the MS spectra of found substances with standard MS spectra from D-base are in the range of 70-95 %.

FCM = Food Contact Material No.

CAS No. = unique numerical identifier assigned by the Chemical Abstracts Service

Annex I = Annex I of Commission Regulation (EU) 10/2011 - list of authorised substances

SML = specific migration limit

NIAS = non-intentionally added substance



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Test results and interpretation of semi-quantitative analysis of NIAS

Sample No. 14674/1 - PRCT L bottle 100% rPET

<u>Table X – part A: Identification and semi-quantification of low molecular substances</u> after migration in 95% ethanol at 60°C for 10 days

Test results (expressed as d-chrysene equivalent)						
No.	Substance identified 1)	FCM	CAS	Value obtained [mg/kg] ²⁾		
1.	1,4-benzenedicarboxylic acid diethylester (diethyl terephthalate)	-	636-09-9	0.10		
2.	Fatty acid ethylesters	878, 879	-	0.20		

Notes to the table X – part A:

FCM = Food Contact Material; figure of FCM listed in Annex I of Commission Regulation 10/2011 CAS = Chemical Abstracts Service

- dentified substances can be either original ones, presented in the sample, or it can be degradation products. Match of the MS spectra of found substances with standard MS spectra from D-base are in the range of 70-95 %. The compounds which are also presented in the blank are not given in the table above.
- Value of the substance migration expressed as mg of d-chrysene equivalent per kg of food for the migration ratio of 6 dm² / 1 kg in accordance with rules given by Commission Regulation 10/2011, Chapter V; Article 17.

Measurement uncertainty is not reported because it is a semi-quantitative determination.

Table X – part B: Interpretation of the test results of semi-quantitative analysis of NIAS

No.	Substance identified	e identified Interpretation	
1.	1,4-benzenedicarboxylic acid diethylester (diethyl terephthalate)	Most likely product of terephthalic acid esterification with ethanol used as the migration medium for screening. Terephthalic acid (FCM 785) is listed in Annex I with SML = 7.5 mg/kg	Compliance
2.	Fatty acid ethylesters	Most likely products of fatty acids esterification with ethanol used as the migration medium for screening. Fatty acids (FCM 12) and their esters (FCM 878, 879) are listed in Annex I with no SML. They are non-volatile substances. The overall migration limit 60 mg/kg is applicable.	Compliance

Notes to the table X – part B:

<u>Annex I</u> = Annex I to Commission Regulation 10/2011 as amended (non-exhausted list of authorised substances).

Overall migration limit = 10 mg/dm² or 60 mg/kg of food is valid for the sum of non-volatile substances with no SML specified in Annex I. In case of volatile substances, it should be verified as the general specific migration limit

SML = specific migration limit

1) Compliance = the content of the assessed substance / group of substances expressed as d-chrysene equivalent for the worst case is below the limit specified.

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