

10 July 2024

First monitoring programme for “PET materials and articles in which the recycled plastic is used behind a Functional Barrier”

In accordance with the requirements of Article 13 of Regulation (EU) 2022/1616, we are herewith reporting the results of the first monitoring program relative to the placing into the market of PET- base A/B/A structures, where the A consist in Virgin PET and B layer is made of r-PET

The requirements of Article 13 of the Regulations are treated in the paragraphs reported in this paper. 13(5)(a)

Description of recycling technology

The process deals exclusively with the PET reels which include the functional barrier, where the r-PET is not in direct contact with food. Starting from hot washed and dried flakes of PET derived from post-consumer collection that comply with the requirements of Article 6 of Regulation (EU) 2022/1616, the manufacturing of A/B/A structures include the following processes:

The flakes are crystallized and decontaminated under high temperature and vacuum

The input material is PET Post-Consumer recycle containing maximum 5% of materials and articles that were used in contact with non-food materials or substances. The input material is fully compliant with the requirements of Article 6 of Regulation (EU) 2022/1616.

The coextrusion stage involves the application of two layers A in a die. In this case the rPET of the future B layer comes in contact with the virgin PET of the future A layers, at a temperature of typically 280°C for few seconds.

The conditions in the MPR reactor at which the decontamination take place are:

- Temperature: >190°C
- Vacuum level: <10 mbar
- Torque: >40%
- Flow: <1100 Kg/h

The layer B is produced in a single screw extruder with a temperature profile that does not exceeds 280 °C.

In order to ensure that the quantity is fulfilled, the extruder is equipped with a gravimetric dosing system with continuous monitoring of the added material.

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The key parameter for coil quality is the functional barrier. It consists of two layers A1 and A2 that are no less than 5% thickness, respectively. Both layers are made by virgin PET material

Capability of decontamination of the Functional Barrier technology

The recycling technology used by Coopbox is a suitable technology listed in Annex I of Regulation CE 1616/22

Decontamination efficiency has been evaluated by EFSA in the Scientific Opinion and has been authorized by RECYC204

In this monitoring program, NIAS screening analysis has been carried out from input and output materials. Input measurements has been performed directly on rPET flakes before the decontamination Output measurements have been performed on rPET flakes after the decontamination and on the final sheets-

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Substances in Input and Output materials

Fornitore CIER

Input flakes R-PET Cier 26/3/2024- LOTTO 00070324205		
NIAS	CAS	Amount mg/kg
Methacroleina	78-85-3	0,9
FURAN, 3-METHYL- AND/OR FURAN, 2-METHYL-	930-27-8 AND/OR 534-22-5	
1,3 dioxolane 2metil	497-26-7	2,16
benzene	71-43-2	0,12
FURAN, TETRAHYDRO- 2-METHYL	96-47-9	0,48
pentanale	110-62-3	4,28
2,4 dimetil furano	3710-43-8	0,73
piridina	110-86-1	0,43
1-pentanol	71-41-0	2,5
Acetilacetone	123-54-6	0,89
2-esanone	591-78-6	0,53
esanale	66-25-1	7,47
CYCLOTRISILOXANE, HEXAMETHYL	541-05-9	0,07
PYRIDINE,2 metil	109-06-8	0,12
FURFURAL	98-01-1	1,08
2-FURANMETHANOL	98-00-0	0,6
2-HEPTANONE	110-43-0	0,74
eptanale	111-71-7	1,2
2-HEPTENAL, (E)- AND/OR 2-HEPTENAL, (Z)-	55-5 AND/OR 5726	1,65
TRIMETHYL BENZENE (MIXED ISOMERS)	25551-13-7	0,29
2-OCTENAL, (E)-	2548-87-0	0,58
nonanale	124-19-6	1,56
2-NONENAL, (E)- AND/OR 2-NONENAL, (Z)-	56-6 AND/OR 6078	0,26
2-DECANONE	693-54-9	0,14
2-DECENAL, (E)-	3913-81-3	0,33
2-UNDECENAL, E- AND/OR 2-UNDECENAL	-07-0 AND/OR 246	0,23
LIMONENE	138-86-3	0,098

Table 1: substances present in the recycled flakes (input materials)

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Residual Contaminants on rPET decontaminated rPET flakes

NIAS	CAS	Amount mg/kg
Methacroleina	78-85-3	0,51
FURAN, 3-METHYL- AND/OR FURAN, 2-METHYL-	930-27-8 AND/OR 534-22-5	0,06
1,3 dioxolane 2metil	497-26-7	0,25
benzene	71-43-2	0,05
pentanale	110-62-3	0,4
2,4 dimetil furano	3710-43-8	0,16
1-pentanol	71-41-0	0,21
2-esanone	591-78-6	0,11
esanale	66-25-1	0,92
CYCLOTRISILOXANE, HEXAMETHYL	541-05-9	0,11
2-HEPTANONE	110-43-0	0,1
eptanale	111-71-7	0,19
2-HEPTENAL, (E)- AND/OR 2-HEPTENAL, (Z)-	55-5 AND/OR 5726	0,18
TRIMETHYL BENZENE (MIXED ISOMERS)	25551-13-7	0,07
2-OCTENAL, (E)-	2548-87-0	0,06
nonanale	124-19-6	0,36
2-NONENAL, (E)- AND/OR 2-NONENAL, (Z)-	56-6 AND/OR 6078	0,04
2-DECENAL, (E)-	3913-81-3	0,06
2-UNDECENAL, E- AND/OR 2-UNDECENAL	-07-0 AND/OR 246	0,03
LIMONENE	138-86-3	0,098

Table 2 reports the substances present in the decontaminated flakes (output materials)

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Residual Contaminants on rPET final sheets A/B/A

Foglia PET mono micron 400- MCPT400840TL-FASCIA 840mm -26/03/2024 - lotto 2110019097								
RT (min)	COMPOUNDS	CAS.NO.	MW (g/mol)	Match quality	RESULT 1 (µg/kg)	RESULT 2 (µg/kg)	RESULT 3 (µg/kg)	SML (Reg.10/2011)
2,16	ACETALDEHYDE	75-07-0	44,05	98,97	6,34	6,70	5,13	6
2,55	ETHANOL	64-17-5	46,07	97,33	0,37	0,24	0,22	60
2,88	ACETONE	67-64-1	58,08	92,67	1,81	1,49	1,10	60
3,24	FORMIC ACID	64-18-6	46,03	97,97	2,51	2,35	2,16	60
3,89	METHACROLEIN	78-85-3	70,09	96,58	0,41	0,26	0,25	(B)
4,36	ACETIC ACID	64-19-7	60,05	98,83	2,23	1,52	1,38	60
4,47	FURAN, 3-METHYL- AND/OR FURAN, 2-METHYL-	930-27-8 AND/OR 534-22-5	82,10	95,28	0,07	0,05	0,05	(B)
4,61	1,3-DIOXOLANE	646-06-0	74,08	92,85	0,07	0,09	0,06	(B)
5,30	1,3-DIOXOLANE, 2-METHYL-	497-26-7	88,11	97,56	1,11	1,18	1,07	(B)
5,55	1-BUTANOL	71-36-3	74,12	90,00	0,07	0,07	0,09	60
5,63	BENZENE	71-43-2	78,11	99,37	0,52	0,52	0,50	(B)

Foglia PET mono micron 400- MCPT400840TL-FASCIA 840mm -26/03/2024 - lotto 2110019097						
RT (min)	COMPOUNDS	CAS.NO.	MW (g/mol)	RESULT 1 (µg/kg)	RESULT 2 (µg/kg)	RESULT 3 (µg/kg)
5,30	1,3-DIOXOLANE, 2-METHYL-	497-26-7	88,11	2,180	2,243	2,187
5,64	BENZENE	71-43-2	78,11	0,829	0,818	0,829
12,70	LIMONENE	138-86-3	136,23	0,426	0,452	0,423

Supplier SKYPLAST

Residual chemicals on rPET flakes (INPUT)

SKYPLAST LOTTO 211223-15 e 211223-18 - SCAGLIA PRE EREMA del 15/01/2024								
RT (min)	COMPOSTO	CAS.NO.	(mg/kg)	(µg/dm ²)	MIGRATION ASSESSMENT (mg/kg)(*)			
					W.C.(A)	LMS (Reg.10/2011)	LMS (RS 817.023.21)	
1,97	ACETALDEHYDE	75-07-0	0,45	N.A.	N.A.	-	6	6
2,33	ETHANOL	64-17-5	1,15	N.A.	N.A.	-	60	60
4,28	ETHYL ACETATE	141-78-6	0,12	N.A.	N.A.	-	60	60
4,94	1,3-DIOXOLANE, 2-METHYL-	497-26-7	0,60	N.A.	N.A.	(B)	--	--
7,96	HEXANAL	66-25-1	0,12	N.A.	N.A.	(B)	--	--
9,27	1-METHOXY-2-PROPYL ACETATE	108-65-6	0,13	N.A.	N.A.	(B)	--	--
12,32	D-LIMONENE AND/OR LIMONENE	5989-27-5 AND/OR 138-86-3	0,14	N.A.	N.A.	(B)	--	--

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Residual chemicals on rPET decontaminated flakes

SCAGLIA POST EREMA del 15/01/2024								
RT (min)	COMPOSTO	CAS.NO.	(mg/kg)	(µg/dm ²)	MIGRATION ASSESSMENT (mg/kg)(*)			
					W.C.(A)	LMS <small>(Reg.10/2011)</small>	LMS <small>(RS 817.023.21)</small>	
4,95	1,3-DIOXOLANE, 2-METHYL-	497-26-7	0,13	N.A.	N.A.	(B)	--	--

Residual chemicals on rPET final sheets A/B/A

SKYPLAST r-PET FOGLIA micron 460 15% v-PET del 15/01/2024 SILICONE DOPPIO LATO WACKER 10%								
RT (min)	COMPOSTO	CAS.NO.	(mg/kg)	(µg/dm ²)	MIGRATION ASSESSMENT (mg/kg)(*)			
					W.C.(A)	LMS <small>(Reg.10/2011)</small>	LMS <small>(RS 817.023.21)</small>	
1,98	ACETALDEHYDE	75-07-0	5,02	30,60	0,184	-	6	6
4,95	1,3-DIOXOLANE, 2-METHYL-	497-26-7	0,44	2,66	0,016	(B)	--	--
5,25	BENZENE	71-43-2	0,13	0,79	0,005	(B)	--	--
7,97	HEXANAL	66-25-1	0,11	0,66	0,004	(B)	--	--

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Decontamination efficiency of Erema Technology

Input flakes R-PET Cier 26/3/2024- LOTTO 00070324205			Output decontaminated flakes R-PET - POST EREMA	Decontamination efficiency
NIAS	CAS	Amount mg/kg	Amount mg/kg	%
Methacroleina	78-85-3	0,9	0,51	43,33333333
1,3 dioxolane 2metil	497-26-7	2,16	0,25	88,42592593
benzene	71-43-2	0,12	0,05	58,33333333
pentanale	110-62-3	4,28	0,4	90,65420561
2,4 dimetil furano	3710-43-8	0,73	0,16	78,08219178
piridina	110-86-1	0,43		
1-pentanol	71-41-0	2,5	0,21	91,6
Acetilacetone	123-54-6	0,89		
2-esanone	591-78-6	0,53	0,11	79,24528302
esanale	66-25-1	7,47	0,92	87,68406961
CYCLOTRILOXANE, HEXAMETHYL	541-05-9	0,07	0,11	-57,14285714
2-HEPTANONE	110-43-0	0,74	0,1	86,48648649
eptanale	111-71-7	1,2	0,19	84,16666667
2-HEPTENAL, (E)- AND/OR 2-HEPTENAL, (Z)-	55-5 AND/OR 5726	1,65	0,18	89,09090909
TRIMETHYL BENZENE (MIXED ISOMERS)	25551-13-7	0,29	0,07	75,86206897
2-OCTENAL, (E)-	2548-87-0	0,58	0,06	89,65517241
nonanale	124-19-6	1,56	0,36	76,92307692
2-NONENAL, (E)- AND/OR 2-NONENAL, (Z)-	56-6 AND/OR 6078	0,26	0,04	84,61538462
2-DECANONE	693-54-9	0,14		
2-DECENAL, (E)-	3913-81-3	0,33	0,06	81,81818182
2-UNDECENAL, E- AND/OR 2-UNDECENAL	707-0 AND/OR 246	0,23	0,03	86,95652174

List of contaminating materials in plastic input coming from supplier

The input material is PET Post-Consumer recycled containing maximum 5% of materials and articles that were used in contact with non-food materials or substances. The input material is fully compliant with the requirements of Article 6 of regulation (EU) 2022/1616. The contaminating materials present in the plastic input are regularly controlled by the waste management and/or preprocessing operators up to the following specifications:

- PVC ≤ 50 ppm
- Polyolefins ≤ 100 ppm
- Other plastics ≤ 50 ppm
- Metals ≤ 10 ppm
- Paper and wood fibres ≤ 10 ppm
- Other inert materials ≤ 5

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Most likely origin of contaminants

There are several sources to which the presence of substances in the input and output plastic can be attributed.

The aldehydes could come from material oxidation into extrusion process

The ethyl acetate could be come from printed label contamination or polymeric solvent.

Measurement or estimation of the migration level

In the present interim report, the company concentrates on the detection of substances present in input and output.

An analysis of migration data related to the most frequent substances detected will be made available

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