

Verificarea programului cu datele din Articol 2

Articol 2: The environmental assessment of two new copper recovery processes from Waste Printed Circuit Boards
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Table 3
 The GEs (A. Inputs; B. Outputs) calculated for the mediated electrochemical oxidation and cathodic deposition of copper from WPCBs (second process).

A. Inputs														
Nr.	Material	Mass index [kg/kg]	Impact factors							Environmental factors, [kg ⁻¹]		Environmental index, [kg ⁻¹]		
			1	2	3	4	5	6	7	EF _{MW}	EF _{Mult}	EI _{MW}	EI _{Mult}	
1	Waste PCB	9.6	C	C	A	C	C	B	C	0.325	5.20	3.12	49.92	
2	Ferric chloride	6.6	C	C	B	C	B	B	C	0.150	1.69	0.99	11.15	
3	Hydrochloric acid	3.8	C	C	C	C	A	B	C	0.250	4.00	0.95	15.20	
4	Water	111.0	C	C	C	C	C	C	C	0.000	1.00	0.00	111.00	
TOTAL:		131.0								Environmental index, [kg ⁻¹]:		5.06		187.27
										General effect index, [kg ⁻¹]:		0.0386		1.43

B. Outputs																		
Nr.	Material	Mass index [kg/kg]	Impact factors											Environmental factors, [kg ⁻¹]		Environmental index, [kg ⁻¹]		
			4	5	6	7	8	9	10	11	12	13	14	EF _{MW}	EF _{Mult}	EI _{MW}	EI _{Mult}	
1	Copper	1.0	C	B	B	C	C	C	C	C	C	C	C	C	0.075	1.30	0.075	1.30
2	Other metals	0.6	C	B	B	C	C	C	C	C	C	C	C	C	0.075	1.30	0.045	0.78
3	Ferric chloride	6.6	C	B	B	C	C	C	A	C	C	C	C	C	0.325	5.20	2.145	34.32
4	Hydrochloric acid	3.8	C	A	B	C	C	C	A	C	C	C	C	C	0.500	16.00	1.900	60.80
5	Epoxy waste	1.5	C	C	B	C	C	C	C	C	B	B	B	0.150	1.69	0.225	2.54	
6	Plastics	3.6	C	C	C	C	B	B	B	C	C	B	B	0.150	1.69	0.540	6.08	
7	Sludge	2.6	C	C	C	C	C	C	C	C	C	B	B	0.075	1.30	0.195	3.38	
8	Water	111.0	C	C	C	C	C	C	C	C	C	C	C	0.000	1.00	0.000	111.00	
9	Losses	0.3	C	C	B	C	C	C	C	C	C	B	B	0.150	1.69	0.045	0.51	
TOTAL:		131.0												Environmental index, [kg ⁻¹]:		5.170		220.71
														General effect index, [kg ⁻¹]:		0.0395		1.68

Introducerea datelor din Articol 2 in programul cfi:

1. Introducerea marimilor de intrare si iesire:

Input data

ID	Component	Mass index (kg)
1	waste PCB	9.6
2	ferric chloride	6.6
3	hydrochloric acid	3.8
4	water	111

Calculate Total input mass: 131

Output data

ID	Component	Mass index (kg)	It is taken into account
1	copper	1	YES
2	other metals	0.6	NO
3	ferric chloride	6.6	NO
4	hydrochloric acid	3.8	NO
5	epoxy waste	1.5	NO
6	plastics	3.6	NO

Calculate Total output mass: 131

2. Calcul MI proces pentru marimile de intrare si iesire:

Mass index for input data

ID	Mli
2	6.6
3	3.8
4	111

MI proces_i: 131

Mass index for output data

ID	Mlo
1	1
2	0.6
3	6.6
4	3.8

MI proces_o: 132

3. Asocierea categoriilor de impact pentru marimile de intrare si iesire :

Impact categories (Input)

- 1. Raw material availability C
- 2. Complexity of the synthesis C
- 3. Critical material use C
- 4. Thermal risks C
- 5. Acute toxicity C
- 6. Chronic toxicity C
- 7. Endocrine disruption potential C
- 8. Global warming potential A
- 9. Ozone depletion potential A
- 10. Acidification potential A
- 11. Photochemical ozone creation potential A
- 12. Odour A
- 13. Eutrophication potential A
- 14. Organic carbon pollution potential A

Input

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
▶	C	C	A	C	C	B	C	A	A	A	A	A	A	A
	C	C	B	C	B	B	C	A	A	A	A	A	A	A
	C	C	C	C	A	B	C	A	A	A	A	A	A	A
	C	C	C	C	C	C	C	A	A	A	A	A	A	A

Add

Impact groups

Output

	Resources	Grey input	Component risk	Organisms	Air	Water/soil
▶	C	A	C	B	A	A
	C	B	C	B	A	A
	C	C	C	A	A	A
	C	C	C	C	A	A

Calculate impact groups for the input data

Impact categories (Output)

- 1. Raw material availability A
- 2. Complexity of the synthesis A
- 3. Critical material use A
- 4. Thermal risks C
- 5. Acute toxicity C
- 6. Chronic toxicity B
- 7. Endocrine disruption potential C
- 8. Global warming potential C
- 9. Ozone depletion potential C
- 10. Acidification potential C
- 11. Photochemical ozone creation potential C
- 12. Odour C
- 13. Eutrophication potential B
- 14. Organic carbon pollution potential B

Input

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
▶	A	A	A	C	B	B	C	C	C	C	C	C	C	C
	A	A	A	C	B	B	C	C	C	C	C	C	C	C
	A	A	A	C	B	B	C	C	C	A	C	C	C	C
	A	A	A	C	A	B	C	C	C	A	C	C	C	C
	A	A	A	C	C	B	C	C	C	A	C	C	B	B
	A	A	A	C	C	C	C	C	C	B	B	C	C	B
	A	A	A	C	C	C	C	C	C	C	C	C	B	B
	A	A	A	C	C	C	C	C	C	C	C	C	C	C
	A	A	A	C	C	B	C	C	C	C	C	C	B	B

Add

Calculate and export environmental factors and general effect indexes

Output

	Resources	Grey input	Component risk	Organisms	Air	Water/soil
▶	A	A	C	B	C	C
	A	A	C	B	C	C
	A	A	C	B	A	C
	A	A	C	A	A	C
	A	A	C	B	A	B
	A	A	C	C	B	B
	A	A	C	C	C	B
	A	A	C	C	C	B
	A	A	C	C	C	C

4. Calcul rezultate in fisiere:

In lucrare: pentru marimile de intrare:

Environmental factors, [kg ⁻¹]		Environmental index, [kg ⁻¹]	
<i>EF_{Mw}</i>	<i>EF_{Mult}</i>	<i>El_{Mw}</i>	<i>El_{Mult}</i>
0.325	5.20	3.12	49.92
0.150	1.69	0.99	11.15
0.250	4.00	0.95	15.20
0.000	1.00	0.00	111.00
Environmental index, [kg ⁻¹]:		5.06	187.27
General effect index, [kg ⁻¹]:		0.0386	1.43

Environmental factors, [kg ⁻¹]		Environmental index, [kg ⁻¹]	
<i>EF_{Mw}</i>	<i>EF_{Mult}</i>	<i>El_{Mw}</i>	<i>El_{Mult}</i>
0.075	1.30	0.075	1.30
0.075	1.30	0.045	0.78
0.325	5.20	2.145	34.32
0.500	16.00	1.900	60.80
0.150	1.69	0.225	2.54
0.150	1.69	0.540	6.08
0.075	1.30	0.195	3.38
0.000	1.00	0.000	111.00
0.150	1.69	0.045	0.51
Environmental index, [kg ⁻¹]:		5.170	220.71
General effect index, [kg ⁻¹]:		0.0395	1.68

Rezultatele obtinute prin programul nostru:

Input

Comp	<i>EF_{Mw}</i> _i	<i>EF_{Mult}</i> _i	<i>El_{Mw}</i> _i	<i>El_{Mult}</i> _i
Input0	0.325000	5.200000	3.120000	49.920000
Input1	0.150000	1.690000	0.990000	11.154000
Input2	0.250000	4.000000	0.950000	15.200000
Input3	0.000000	1.000000	0.000000	111.000000

Output

Comp	EFmw_o	EFmult_o	Elmw_o	Elmult_o
Output0	0.075000	1.300000	0.075000	1.300000
Output1	0.075000	1.300000	0.045000	0.780000
Output2	0.325000	5.200000	2.145000	34.320000
Output3	0.500000	16.000000	1.900000	60.800000
Output4	0.400000	6.760000	0.600000	10.140000
Output5	0.150000	1.690000	0.540000	6.084000
Output6	0.075000	1.300000	0.195000	3.380000
Output7	0.000000	1.000000	0.000000	111.000000
Output8	0.150000	1.690000	0.045000	0.507000

Elmw_process_i=10.12
Elmult_process_i=374.548

Elmw_process_o=5.545
Elmult_process_o=228.311

GEImw_i=0.0772519083969466
GEImult_i=2.85914503816794
GEImw_o=0.0420075757575758
GEImult_o=1.72962878787879

Se observa ca datele din lucrare sunt identice cu cele din rulara programului cfi in prima parte de calcul dar difera in calculul datelor finale , probabil din cauza unor marimi de iesire care nu se iau in calcul.