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Printed circuit board recycling: a focus on a novel, efficient and sustainable process for spent critical metals recovery

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Supplementary Table S1. Metal content of different PCBs from different referenced studies

Metal content	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[12]	[12]	[12]	[13]	[14]
Cu (%)	19	20	22	12.5	26.8	15.6	19.66	28.7	27.6	14.6	14.2	18.84	24.19	14.52	16.3	18.01	12.37
Al (%)	4.1	2	–	2.04	4.7	–	2.88	1.7	–	–	–	–	–	–	–	12.63	10.1
Pb (%)	1.9	2	1.55	2.7	–	1.35	3.93	1.3	–	2.96	2.5	0.71	1.13	0.4	0.27	–	0.013
Zn (%)	0.8	1	–	0.08	1.5	0.16	2.1	–	2.7	–	0.18	–	–	–	–	1.13	8
Ni (%)	0.8	2	0.32	0.7	0.47	0.28	0.38	–	0.3	1.65	0.41	0.69	0.43	1.13	0.89	–	4.05
Fe (%)	3.6	8	3.6	0.6	5.3	1.4	11.47	0.6	2.9	4.79	3.08	0.18	0.17	0.19	0.1	0.54	10.4
Sn (%)	1.1	4	2.6	4	1	3.24	3.68	3.8	–	5.62	4.79	1.81	1.46	1.23	1.56	1.01	–
Sb (%)	–	–	–	–	0.06	–	–	–	–	–	0.05	–	–	–	–	–	–
Cr (%)	–	–	–	–	–	–	0.005	–	–	0.356	–	–	–	–	–	–	–
Na (%)	–	–	–	–	–	–	–	–	–	–	0.48	–	–	–	–	–	–
Ca (%)	–	–	–	–	–	–	1.13	–	1.4	–	1.69	–	–	–	–	7.99	–
Ba (%)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3.05	–
Ag (ppm)	5210	2000	–	300	3300	1240	500	79	–	450	317	900	0	0	0	–	1900
Au (ppm)	1120	1000	350	-	80	420	300	68	–	205	142	4200	2000	2400	900	–	200
Pt (ppm)	–	–	–	–	–	–	–	0	–	–	–	–	–	–	–	–	–
Cd (ppm)	–	–	–	–	–	–	–	–	–	–	1183	–	–	–	–	–	–
K (ppm)	–	–	–	–	–	–	–	–	–	–	180	–	–	–	–	–	–
In (ppm)	–	–	–	–	–	–	500	–	–	–	–	–	–	–	–	–	–
Mn (ppm)	–	–	–	–	–	–	9700	–	4000	–	81	–	–	–	–	–	–
Se (ppm)	–	–	–	–	–	–	–	–	–	–	21	–	–	–	–	–	–
As (ppm)	–	–	–	–	–	–	–	–	–	–	11	–	–	–	–	–	–
Mg (ppm)	–	–	–	500	–	–	1000	–	–	–	–	–	–	–	–	–	–
Pd (ppm)	–	50	–	–	–	–	–	33	–	220	–	–	–	–	–	–	–
Co (ppm)	–	–	–	–	–	–	300	–	–	–	–	–	–	–	–	–	–
Ti (ppm)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Ta (ppm)	–	–	–	–	–	–	–	–	–	–	–	800	0	0	0	–	–
REEs (ppm)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	30.47	–
Total metals (%)	31.9	39.3	30.1	22.6	40.2	22.2	46.5	36.1	35.3	30.1	27.6	22.8	27.6	17.7	19.2	44.4	45.1

(continued on next page)

Supplementary Table S1. (continued)

Metal content	[15]	[16]	[17]	[18]	[19]	[20]	[21]	[22]	[23]	Average	Standard Dev.
Cu (%)	12.58	19.19	28.00	34.49	37.18	41.00	11.53	41.76	43.19	22.3	9.5
Al (%)	2.38	7.06	2.60	0.26	0.61		0.68	1.13	2.78	3.7	3.3
Pb (%)	2.44	1.01		1.87	7.87		6.29	0.12	11.83	2.5	2.7
Zn (%)		0.73		5.92	1.82	5.00	1.04	0.33	14.25	2.5	3.6
Ni (%)	0.39	5.35	0.26	2.63	2.54	7.00	0.32	2.92	13.44	2.0	2.9
Fe (%)	3.24	3.56	0.08	10.57	4.85	38.00	–	44.76	13.90	6.4	10.4
Sn (%)	–	–	–	–	–	–	–	–	–	2.6	1.5
Sb (%)	–	–	–	–	–	–	–	–	–	0.1	0.0
Cr (%)	–	–	–	–	–	–	–	–	–	0.2	0.2
Na (%)	–	–	–	–	–	–	–	–	–	0.5	N/A
Ca (%)	–	–	–	–	–	–	–	–	–	3.1	3.3
Ba (%)	–	–	–	–	–	–	–	–	–	3.1	N/A
Ag (ppm)	–	2000	130.0	–	–	–	5200.0	1400.0	100.0	1171.0	1570.3
Au (ppm)	–	700	29.0	–	–	–	3100.0	1300.0	3100.0	991.5	1210.2
Pt (ppm)	–	–	–	–	–	–	–	–	–	0.0	N/A
Cd (ppm)	–	–	–	–	–	–	–	–	–	1183.0	N/A
K (ppm)	–	–	–	–	–	–	–	–	–	180.0	N/A
In (ppm)	–	–	–	–	–	–	–	–	–	500.0	N/A
Mn (ppm)	–	–	–	–	–	–	–	–	–	4593.7	4836.9
Se (ppm)	–	–	–	–	–	–	–	–	–	21.0	N/A
As (ppm)	–	–	–	–	–	–	–	–	–	11.0	N/A
Mg (ppm)	–	–	–	–	–	–	–	–	–	750.0	353.6
Pd (ppm)	–	–	–	–	–	–	–	–	–	101.0	103.4
Co (ppm)	–	–	–	–	–	–	–	–	–	350.0	70.7
Ti (ppm)	–	–	–	–	–	–	–	–	–	400.0	N/A
Ta (ppm)	–	–	–	–	–	–	–	–	–	200.0	400.0
REEs (ppm)	–	–	–	–	–	–	–	–	–	30.5	N/A
Total Metals (%)	21.0	37.2	31.0	55.7	54.9	91.0	20.7	91.3	99.7	38.5	21.4

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