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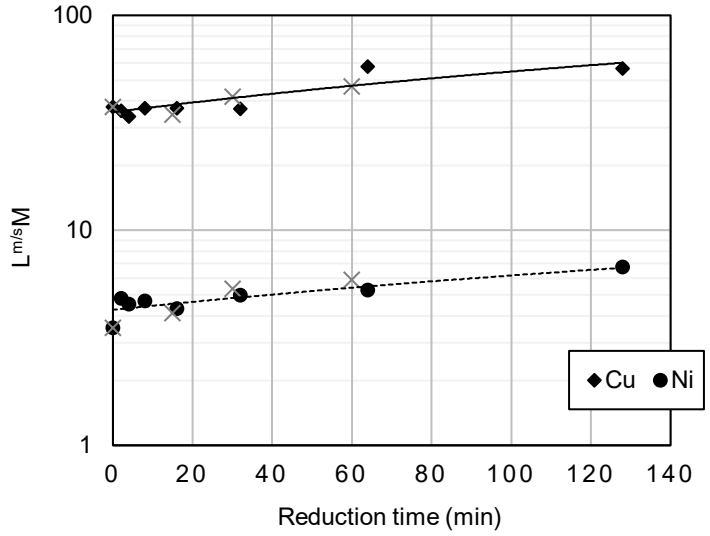
"Utilization of Scrap Metals as Reductants for Improved Ni and Cu Recoveries in Copper Smelting"

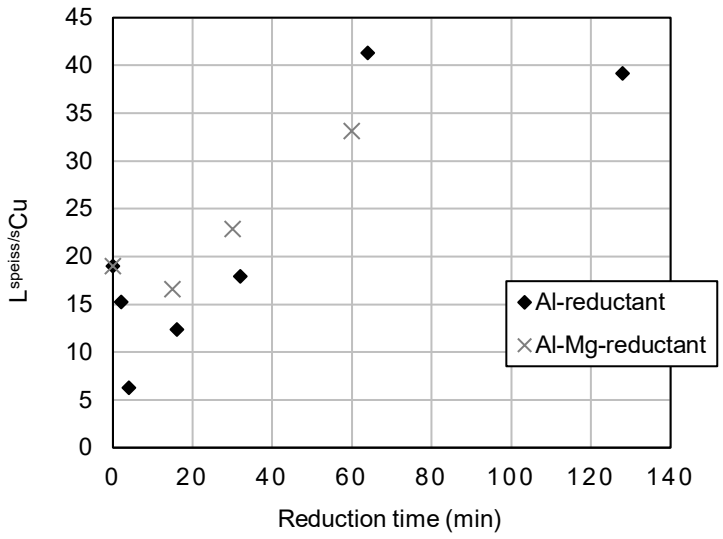
Katri Avarmaa*, Lassi Klemettinen, Pekka Taskinen, Daniel Lindberg, Jouni Pihlasalo, Hannu Johto, Ari Jokilaakso

kavarmaa@swin.edu.au

Table S1. The elemental detection limits (with standard deviations) of EPMA analysis for different phases in ppmw.

	Na	Mg	Al	Si	S	K	Ca	Cr	Fe	Co
Matte	626±22	357±16	208±13	249±23	133±19	120±2	138±4	210±5	197±7	170±13
Slag	373±17	194±14	138±6	187±7	123±5	101±2	95±2	174±4	204±5	194±6
Reductant	220±88	189±72	159±42	25±32	119±42	102±12	89±9	181±13	200±25	182±33
	Ni	Cu	Zn	As	Sb	Pb	Bi	Mo	O	Ti
Matte	324±17	409±10	415±6	5737±271	286±27	6433±792	2478±279	823±158		
Slag	237±6	340±10	338±9	4600±105	269±6	4818±123	1769±45	464±41	1239±43	
Reductant	253±49	316±65	344±50	4740±688	224±27	4898±705	1820±245	533±166	1473±488	236±23





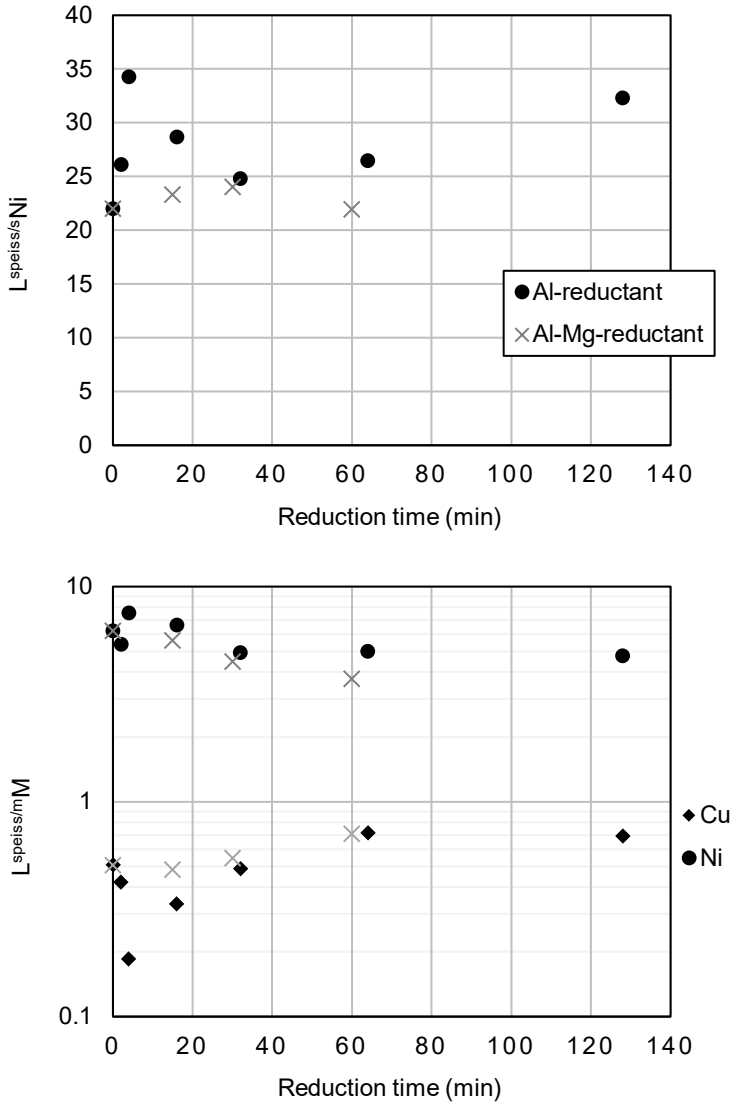


Figure S1. Distribution coefficients of copper and nickel between matte and slag ($L^{m/s}$), speiss and slag ($L^{speiss/s}$) and speiss and matte ($L^{speiss/m}$).

Table S2. Phase compositions (wt%) in the interaction areas of Al reductant indicating to Figure 11 in the manuscript. Analyses taken with spot size of 1 µm, if not separately mentioned in comments.

Sample	No.	O	Al	Si	Fe	Ni	Cu	Other elements	Comments
OT18	1.	0.4	2.5	0.7	63.0	17.4	14.5	1.4	
	2.	1.1	57.3	1.8	36.0	2.3	1.0	0.5	
	3.	1.6	70.3	7.2	1.9	2.2	16.5	0.3	
OT19	1.	0.5	11.8	4.0	66.5	7.3	9.3	0.6	
	2.	0.6	17.5	4.9	59.4	6.3	10.8	0.4	
	3.	0.6	6.5	4.7	41.7	15.9	24.0	6.6	
	4.	0.5	15.1	3.7	42.8	23.4	13.4	1.0	
OT20	1.	0.6	0.0	0.0	70.2	14.6	13.0	1.5	
	2.	0.5	8.1	0.9	21.4	15.2	52.2	1.8	
	2.	0.5	7.1	0.4	11.5	10.7	68.2	1.6	Heavier veins
	3.	0.6	0.0	0.1	92.1	0.3	6.6	0.4	
	4.	0.8	30.3	2.8	30.3	16.4	18.9	0.5	
OT22	1.	1.2	56.4	6.3	27.9	1.5	6.4	0.3	
	2.	0.4	3.8	2.7	32.4	16.8	38.8	5.1	
	3.	0.5	0.1	0.2	73.1	12.2	12.8	1.0	
OT23	1.	0.6	30.0	2.1	35.2	9.1	22.2	0.8	
	2.	1.1	55.1	3.6	26.8	4.3	9.0	0.2	
	3.	0.5	27.3	4.0	43.2	5.8	18.8	0.5	
	4.	0.5	22.7	1.9	45.3	11.9	17.1	0.6	
	5.	0.4	10.0	1.6	64.9	9.9	12.5	0.8	
OT24	1.	1.1	1.6	0.3	16.6	12.1	64.3	3.9	Heavier phase
	2.	0.4	0.4	0.6	58.1	21.1	15.4	4.0	Lighter phase
	3.	40.6	31.4	15.9	6.6	0.9	3.0	1.6	Al-rich phase, slag?
	4.	0.4	0.1	0.0	53.1	24.5	16.5	4.1	Main other Mo 3.7 wt%
	5.	43.0	13.9	20.2	20.2	0.0	0.4	2.3	Heavier phase, slag
	5.	48.1	37.0	12.4	2.0	0.1	0.3	0.5	Lighter phase
OT36	1.	45.0	16.7	23.6	9.4	0.2	0.5	4.7	
	2.	0.4	3.5	0.9	31.5	23.5	37.1	3.1	Area analysis, 50µm
	3.	0.4	0.1	0.1	19.4	17.9	57.9	4.2	Area analysis, 50µm
	4.	0.3	0.0	0.1	55.5	23.2	17.2	3.6	Area analysis, 50µm

Table S3. Phase compositions (wt%) in the interaction areas of Al-Mg reductant indicating to Figure 12. Analyses taken with spot size of 1 µm, if not separately mentioned in comments.

Sample	No.	O	Al	Si	Fe	Ni	Cu	Other elements	Comments
OT45	1.	0.3	4.3	5.5	59.1	9.1	20.3	1.1	Area analysis 50 µm
	2.	0.4	44.1	6.9	39.3	1.2	7.2	0.8	Lighter phase
	2.	0.3	24.2	11.8	54.3	3.6	5.2	0.4	Heavier phase
	3.	42.0±0.1	53.4±0.7	1.0±0.2	2.4±0.2	0.3±0.1	0.7±0.4	0.3±0.1	Average of two points
	4.	39.4	47.1	4.8	6.6	0.4	1.5	0.3	
OT46	1.	12.7	14.8	4.1	36.6	11.7	17.2	2.9	Area analysis 50 µm
	1.	0.3	2.9	1.3	64.6	15.7	12.0	3.2	Heavier phase
	1.	48.9	20.8	22.9	2.5	0.3	0.3	4.2	Lighter phase, Mg 1.3 wt%
	2.	6.1	11.2	1.9	37.4	15.4	25.2	2.9	Area analysis 50 µm
	3.	0.3	0.1	0.4	55.2	23.2	15.7	5.1	
	4.	52.2	46.5	0.2	0.3	0.1	0.2	0.5	Area analysis 50 µm
	5.	44.0	54.2	0.4	0.6	0.1	0.4	0.2	
	6.	37.0	52.5	1.0	3.7	2.0	3.5	0.4	Area analysis 50 µm
	6.	29.4	52.2	2.0	7.8	3.8	4.1	0.6	
	7.	45.8	51.1	0.2	0.9	0.6	1.0	0.4	Area analysis 50 µm
	8.	30.3	42.6	1.1	8.3	6.5	10.5	0.7	Area analysis 50 µm
OT49	1.	0.3	1.7	1.0	57.9	23.1	15.2	0.9	
	2.	0.3	0.1	0.2	20.7	28.6	46.5	3.7	Area analysis 100 µm
	3.	6.8	8.0	1.0	33.1	22.3	25.5	3.4	Area analysis 100 µm
	3.	0.4	0.7	0.5	51.0	26.9	17.3	3.2	Heavier phase
	3.	45.7	25.8	20.9	3.3	0.3	0.8	3.2	Lighter phase, Mg 1.4 wt%
	4.-6.	46.2-46.9	10.4-12.3	24.6-27.3	8.1-14.3	0-0.04	0.1-0.2	3.9-5.3	Mg 1.2-1.6 wt%