

Article

Continuous Bioleaching of Arsenic-Containing Copper-Zinc Concentrate and Shift of Microbial Population under Various Conditions

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Table S1. Mineral content in the concentrate (based on XRD data).

Content, %					
Chalcopyrite (CuFeS ₂)	Tennantite (Cu ₁₂ As ₄ S ₁₃)	Sphalerite (ZnS)	Pyrite (FeS ₂)	Quartz (SiO ₂)	Gypsum (CaSO ₄ ·2H ₂ O)
10	14	15	50	7	3

Table S2. As, Cu, and Zn extraction (%) during biooxidation.

T, °C	Carbon Source	Extraction, %		
		As	Cu	Zn
40	CO ₂	24.5±1.5	19.5±0.9	77.4±3.6
	Molasses	24.1±0.6	20.2±0.4	79.8±1.6
	Aeration (control)	24.7±0.0	18.7±0.7	79.5±3.3
45	CO ₂	26.9±1.0	24.5±1.8	78.6±1.6
	Molasses	25.6±1.4	26.1±1.3	78.9±1.9
	Aeration (control)	25.1±1.5	23.0±1.2	82.1±1.8
50	CO ₂	28.4±0.3	25.5±1.5	71.1±5.0
	Molasses	25.7±1.7	27.0±1.1	67.7±3.6
	Aeration (control)	27.1±0.6	23.9±5.6	68.1±16.8
55	CO ₂	20.0±2.1	22.2±1.0	70.4±3.8
	Molasses	13.9±1.7	20.2±1.1	67.0±5.0
	Aeration (control)	5.4±7.6	21.8±0.6	70.6±1.5
60	CO ₂	0.7±0.2	20.1±2.8	62.3±5.3
	Molasses	0.6±0.1	9.9±0.3	41.2±1.7
	Aeration (control)	0.7±0.1	10.3±1.1	45.3±3.8

Table S3. Chemical composition of bioleaching residues.

Temperature, °C	Carbon Source	Content, %							
		As	Fe	Cu	Zn	S _{total}	S _{sulfate}	S ⁰	S _{sulfide}
40	CO ₂	2.65	24.80	10.80	3.07	30.6	1.2	1.4	28.0
	Molasses	2.85	24.70	10.80	2.90	30.1	1.2	1.3	27.6
	Aeration (control)	2.70	25.00	10.00	2.66	30.6	1.2	1.2	28.2
45	CO ₂	3.10	21.20	11.95	4.00	28.8	1.4	0.8	26.6
	Molasses	2.30	25.85	9.10	3.05	32.5	1.2	0.8	30.5
	Aeration (control)	2.55	26.75	10.25	2.80	32.9	1.3	0.6	31.0
50	CO ₂	2.60	26.75	11.40	3.50	30.9	1.8	1.3	27.8
	Molasses	2.25	27.75	9.72	4.50	33.2	2.0	1.2	30.0
	Aeration (control)	2.45	24.75	9.95	2.97	30.8	2.1	1.2	27.5
55	CO ₂	2.25	30.00	7.75	2.37	34.2	2.4	1.5	30.3
	Molasses	1.60	36.80	5.42	3.05	37.7	1.9	1.5	34.3
	Aeration (control)	1.95	34.40	6.65	2.05	36.6	2.2	1.3	33.1
60	CO ₂	2.10	30.10	5.50	3.15	38.2	2.1	1.7	34.4
	Molasses	1.80	29.50	5.60	5.20	38.6	1.2	1.6	35.8
	Aeration (control)	2.10	30.00	6.10	4.10	39.1	0.5	1.3	37.3