



Appendix

Table A1. Averaged results of flotation tests of sandstone copper ore in Denver flotation machine (E – water solution of ethyl sodium xanthate; Z – water solution of isobutyl sodium xanthate)

No of test	Flotation machine	Copper ore type		Particle size fraction	Type of collector	Dose of collector
1	Denver	sandstone		0-20 μm	Ε	100 g/Mg
Product	γ	λ	β	θ	ε	η
			12,13%	1,55%	0,00%	100,00%
P1	11.41%	11.35%	11.35%	0.29%	83.44%	16.56%
P2	7.37%	1.31%	7.41%	0.20%	89.67%	10.33%
P3	8.68%	0.53%	5.24%	0.16%	92.63%	7.37%
P4	5.86%	0.36%	4.38%	0.14%	93.98%	6.02%
P5	5.15%	0.37%	3.84%	0.12%	95.19%	4.81%
P6	4.14%	0.30%	3.50%	0.11%	95.99%	4.01%
P7	12.12%	0.15%	2.76%	0.10%	97.14%	2.86%
P8	3.94%	0.13%	2.58%	0.09%	97.48%	2.52%
Р9	3.08%	0.10%	2.46%	0.09%	97.68%	2.32%
Т	38.26%	0.09%	1.55%	0.00%	100.00%	0.00%
	F1 ()	6		Particle	T (
No of test	Flotation	Copper ore		size	Type of	Dose of
machine	machine	type		fraction	collector	collector
2	Denver	sandstone		0-20 μm	Ε	150 g/Mg
Product	γ	λ	β	θ	ε	η
			2.60%	0.51%	0.00%	100.00%
P1	14.87%	1.82%	1.82%	0.28%	53.14%	46.86%
P2	7.22%	1.29%	1.65%	0.19%	71.47%	28.53%
P3	9.63%	0.28%	1.23%	0.17%	76.71%	23.29%
P4	6.53%	0.38%	1.09%	0.15%	81.53%	18.47%
P5	7.31%	0.32%	0.96%	0.13%	86.05%	13.95%
P6	5.87%	0.29%	0.89%	0.11%	89.40%	10.60%
P7	5.37%	0.25%	0.83%	0.09%	92.08%	7.92%
P8	3.74%	0.20%	0.79%	0.08%	93.53%	6.47%
Р9	6.47%	0.14%	0.72%	0.07%	95.34%	4.66%
Т	32.98%	0.07%	0.51%	0.00%	100.00%	0.00%
	Elst d'an	C		Particle	Tana (D (
No of test	Flotation machine	Copper ore		size	Type of collector	Dose of
	machine	type		fraction	collector	collector
3	Denver	sandstone		0-20 μm	Z	100 g/Mg
Product	γ	λ	β	θ	ε	η
			9.22%	1.50%	0.00%	100.00%
P1	11.73%	8.44%	8.44%	0.58%	66.09%	33.91%
P2	4.75%	5.06%	7.47%	0.32%	82.15%	17.85%
P3	9.81%	0.98%	5.05%	0.23%	88.55%	11.45%
P4	5.46%	0.62%	4.29%	0.20%	90.82%	9.18%
		0.409/	2 (00/	0.170/	92.73%	7.27%
P5	5.86%	0.49%	3.69%	0.17%	92.13/0	1.21 /0

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P7	4.45%	0.39%	3.10%	0.14%	94.97%	5.03%
P8	2.93%	0.33%	2.93%	0.13%	95.61%	4.39%
Р9	3.84%	0.25%	2.74%	0.12%	96.24%	3.76%
Т	47.32%	0.12%	1.50%	0.00%	100.00%	0.00%
		6		Particle	— (
No of test	Flotation	Copper ore		size	Type of	Dose of
	machine	type		fraction	collector	collector
4	Denver	sandstone		0-20 μm	Z	150 g/Mg
Product	γ	λ	β	θ	ε	η
			2.30%	0.54%	0.00%	100.00%
P1	14.35%	1.52%	1.52%	0.37%	40.63%	59.37%
P2	8.88%	1.27%	1.42%	0.27%	61.57%	38.43%
P3	14.88%	0.56%	1.09%	0.20%	77.21%	22.79%
P4	9.81%	0.33%	0.93%	0.17%	83.21%	16.79%
P5	8.74%	0.27%	0.83%	0.15%	87.55%	12.45%
P6	6.74%	0.29%	0.77%	0.13%	91.16%	8.84%
P7	8.48%	0.21%	0.71%	0.11%	94.45%	5.55%
P8	5.54%	0.21%	0.67%	0.08%	96.65%	3.35%
Р9	4.30%	0.12%	0.64%	0.07%	97.62%	2.38%
Т	18.28%	0.07%	0.54%	0.00%	100.00%	0.00%
	Flotation	Copper ore		Particle	Type of	Dose of
No of test	machine	type		size	collector	collector
	machine	type		fraction	conector	concetor
5	Denver	sandstone		20-40 µm	Ε	100 g/Mg
Product	γ	λ	β	θ	ε	η
			13.93%	0.63%	0.00%	100.00%
P1	4.33%	13.15%	13.15%	0.06%	90.18%	9.82%
P2	1.91%	0.66%	9.32%	0.05%	92.17%	7.83%
P3	3.22%	0.22%	6.22%	0.05%	93.28%	6.72%
P4	2.22%	0.13%	5.07%	0.04%	93.74%	6.26%
P5	2.52%	0.11%	4.19%	0.04%	94.16%	5.84%
P6	2.11%	0.08%	3.66%	0.04%	94.42%	5.58%
P7	2.42%	0.07%	3.19%	0.040/		
P8	3.83%			0.04%	94.67%	5.33%
P9		0.03%	2.66%	0.04%	94.85%	5.15%
	6.24%	0.02%	2.66% 2.08%	0.04% 0.04%	94.85% 95.04%	5.15% 4.96%
Т			2.66%	0.04% 0.04% 0.00%	94.85%	5.15%
	6.24% 71.20%	0.02% 0.04%	2.66% 2.08%	0.04% 0.04% 0.00% Particle	94.85% 95.04% 100.00%	5.15% 4.96% 0.00%
T No of test	6.24% 71.20% Flotation	0.02% 0.04% Copper ore	2.66% 2.08%	0.04% 0.04% 0.00% Particle size	94.85% 95.04% 100.00% Type of	5.15% 4.96% 0.00% Dose of
No of test	6.24% 71.20% Flotation machine	0.02% 0.04% Copper ore type	2.66% 2.08%	0.04% 0.04% 0.00% Particle size fraction	94.85% 95.04% 100.00% Type of collector	5.15% 4.96% 0.00% Dose of collector
No of test	6.24% 71.20% Flotation machine Denver	0.02% 0.04% Copper ore type sandstone	2.66% 2.08% 0.63%	0.04% 0.04% 0.00% Particle size fraction 20-40 μm	94.85% 95.04% 100.00% Type of collector E	5.15% 4.96% 0.00% Dose of collector 150 g/Mg
No of test	6.24% 71.20% Flotation machine	0.02% 0.04% Copper ore type	2.66% 2.08% 0.63%	0.04% 0.04% 0.00% Particle size fraction 20-40 μm §	94.85% 95.04% 100.00% Type of collector Ε ε	5.15% 4.96% 0.00% Dose of collector 150 g/Mg η
No of test 6 Product	6.24% 71.20% Flotation machine Denver γ	0.02% 0.04% Copper ore type sandstone λ	2.66% 2.08% 0.63% β 8.15%	0.04% 0.04% 0.00% Particle size fraction 20-40 μm θ 0.61%	94.85% 95.04% 100.00% Type of collector Ε ε 0.00%	5.15% 4.96% 0.00% Dose of collector 150 g/Mg η 100.00%
No of test 6 Product P1	6.24% 71.20% Flotation machine Denver γ 7.52%	0.02% 0.04% Copper ore type sandstone λ 7.37%	2.66% 2.08% 0.63% β 8.15% 7.37%	0.04% 0.00% Particle size fraction 20-40 μm § 0.61% 0.06%	94.85% 95.04% 100.00% Type of collector Ε ε 0.00% 91.04%	5.15% 4.96% 0.00% Dose of collector 150 g/Mg η 100.00% 8.96%
No of test 6 Product P1 P2	6.24% 71.20% Flotation machine Denver γ 7.52% 2.20%	0.02% 0.04% Copper ore type sandstone λ 7.37% 0.65%	2.66% 2.08% 0.63% β 8.15% 7.37% 5.84%	0.04% 0.00% Particle size fraction 20-40 μm	94.85% 95.04% 100.00% Type of collector E ε 0.00% 91.04% 93.39%	5.15% 4.96% 0.00% Dose of collector 150 g/Mg η 100.00% 8.96% 6.61%
No of test 6 Product P1 P2 P3	6.24% 71.20% Flotation machine Denver γ 7.52% 2.20% 2.91%	0.02% 0.04% Copper ore type sandstone λ 7.37% 0.65% 0.31%	2.66% 2.08% 0.63% 8.15% 7.37% 5.84% 4.57%	0.04% 0.00% Particle size fraction 20-40 μm § 0.61% 0.06% 0.04% 0.04%	94.85% 95.04% 100.00% Type of collector E ε 0.00% 91.04% 93.39% 94.85%	5.15% 4.96% 0.00% Dose of collector 150 g/Mg η 100.00% 8.96% 6.61% 5.15%
No of test 6 Product P1 P2 P3 P4	6.24% 71.20% Flotation machine Denver γ 7.52% 2.20% 2.91% 4.01%	0.02% 0.04% Copper ore type sandstone λ 7.37% 0.65% 0.31% 0.13%	2.66% 2.08% 0.63% 8.15% 7.37% 5.84% 4.57% 3.50%	0.04% 0.00% Particle size fraction 20-40 μm § 0.61% 0.06% 0.04% 0.04% 0.03%	94.85% 95.04% 100.00% Type of collector E ε 0.00% 91.04% 93.39% 94.85% 95.71%	5.15% 4.96% 0.00% Dose of collector 150 g/Mg η 100.00% 8.96% 6.61% 5.15% 4.29%
No of test 6 Product P1 P2 P3 P4 P5	6.24% 71.20% Flotation machine Denver γ 7.52% 2.20% 2.91% 4.01% 4.81%	$\begin{array}{c} 0.02\% \\ 0.04\% \end{array}$ Copper ore type sandstone λ 7.37% 0.65% 0.31% 0.13% 0.07%	2.66% 2.08% 0.63% 8.15% 7.37% 5.84% 4.57% 3.50% 2.73%	0.04% 0.00% Particle size fraction 20-40 μm 9 0.61% 0.06% 0.04% 0.04% 0.03% 0.03%	94.85% 95.04% 100.00% Type of collector E ε 0.00% 91.04% 93.39% 94.85% 95.71% 96.26%	5.15% 4.96% 0.00% Dose of collector 150 g/Mg η 100.00% 8.96% 6.61% 5.15% 4.29% 3.74%
No of test 6 Product P1 P2 P3 P4 P5 P6	6.24% 71.20% Flotation machine Denver γ 7.52% 2.20% 2.91% 4.01% 4.81% 4.71%	$\begin{array}{c} 0.02\% \\ 0.04\% \\ \hline \end{array}$	2.66% 2.08% 0.63% 8.15% 7.37% 5.84% 4.57% 3.50% 2.73% 2.25%	0.04% 0.00% Particle size fraction 20-40 μm § 0.61% 0.06% 0.04% 0.04% 0.04% 0.03% 0.03%	$\begin{array}{c} 94.85\%\\ 95.04\%\\ 100.00\%\\ \hline \textbf{Type of collector}\\ \hline \textbf{E}\\ \varepsilon\\ 0.00\%\\ 91.04\%\\ 93.39\%\\ 94.85\%\\ 95.71\%\\ 96.26\%\\ 96.65\%\\ \end{array}$	5.15% 4.96% 0.00% Dose of collector 150 g/Mg η 100.00% 8.96% 6.61% 5.15% 4.29% 3.74% 3.35%
No of test 6 Product P1 P2 P3 P4 P5	6.24% 71.20% Flotation machine Denver γ 7.52% 2.20% 2.91% 4.01% 4.81%	$\begin{array}{c} 0.02\% \\ 0.04\% \end{array}$ Copper ore type sandstone λ 7.37% 0.65% 0.31% 0.13% 0.07%	2.66% 2.08% 0.63% 8.15% 7.37% 5.84% 4.57% 3.50% 2.73%	0.04% 0.00% Particle size fraction 20-40 μm 9 0.61% 0.06% 0.04% 0.04% 0.03% 0.03%	94.85% 95.04% 100.00% Type of collector E ε 0.00% 91.04% 93.39% 94.85% 95.71% 96.26%	5.15% 4.96% 0.00% Dose of collector 150 g/Mg η 100.00% 8.96% 6.61% 5.15% 4.29% 3.74%

Do	4.04.0/	0.000/	4 = 00/	0.000/		a - 00/
P9	4.81%	0.03%	1.50%	0.03%	97.41%	2.59%
Т	60.52%	0.03%	0.61%	0.00%	100.00%	0.00%
NT () (Flotation	Copper ore		Particle	Type of	Dose of
No of test	machine	type		size	collector	collector
7	Denver	sandstone		fraction	Z	100 ~/M~
7 Product		λ	Q	20-40 μm θ		100 g/Mg
Froduct	γ	Λ	β 18.32%	9 1.51%	ε 0.00%	η 100.00%
P1	7.46%	17.54%	17.54%	0.22%	86.46%	13.54%
P2	3.86%	2.10%	12.28%	0.22 %	91.82%	8.18%
P3	3.80 % 4.77%	0.88%	12.28 % 8.90%	0.14%	91.82 % 94.58%	5.42%
P4	4.77 % 3.45%	0.37%	7.39%	0.10%	94.38 % 95.43%	4.57%
Р4 Р5		0.37%	7.39% 6.70%	0.09%	95.43% 95.89%	4.37% 4.11%
	2.13%					
P6	2.23%	0.24%	6.09%	0.07%	96.24%	3.76%
P7	2.49%	0.22%	5.54%	0.07%	96.60%	3.40%
P8	1.83%	0.17%	5.19%	0.07%	96.80%	3.20%
P9	3.15%	0.13%	4.68%	0.06%	97.08%	2.92%
Т	68.63%	0.06%	1.51%	0.00%	100.00%	0.00%
•	Flotation	Copper ore		Particle	Type of	Dose of
No of test	machine	type		size	collector	collector
				fraction		
8	Denver	sandstone	_	20-40 μm	Z	150 g/Mg
Product	γ	λ	β	θ	3	η
			7.43%	0.26%	0.00%	100.00%
P1	2.76%	6.65%	6.65%	0.08%	69.37%	30.63%
P2	3.56%	0.63%	3.26%	0.06%	77.86%	22.14%
P3	2.61%	0.36%	2.41%	0.05%	81.43%	18.57%
P4	3.96%	0.24%	1.75%	0.05%	85.09%	14.91%
P5	3.06%	0.13%	1.44%	0.04%	86.60%	13.40%
P6	3.61%	0.11%	1.19%	0.04%	88.05%	11.95%
P7	2.51%	0.09%	1.07%	0.04%	88.86%	11.14%
P8	2.20%	0.07%	0.97%	0.04%	89.45%	10.55%
P9	3.11%	0.06%	0.87%	0.04%	90.11%	9.89%
Т	72.65%	0.04%	0.26%	0.00%	100.00%	0.00%
	Flotation	Copper ore		Particle	Type of	Dose of
No of test	machine	type		size	collector	collector
	machine	type		fraction	concetor	concetor
9	Denver	sandstone		40-71 μm	Ε	100 g/Mg
Product	γ	λ	β	θ	3	η
			29.04%	1.21%	0.00%	100.00%
P1	3.87%	28.26%	28.26%	0.12%	90.55%	9.45%
P1 P2	3.87% 1.42%	28.26% 1.56%	28.26% 21.07%	0.12% 0.10%	90.55% 92.39%	9.45% 7.61%
P2	1.42%	1.56%	21.07%	0.10%	92.39%	7.61%
P2 P3	1.42% 2.75%	1.56% 0.49%	21.07% 14.04%	0.10% 0.09%	92.39% 93.51%	7.61% 6.49%
P2 P3 P4	1.42% 2.75% 2.14%	1.56% 0.49% 0.44%	21.07% 14.04% 11.18%	0.10% 0.09% 0.08%	92.39% 93.51% 94.30%	7.61% 6.49% 5.70%
P2 P3 P4 P5	1.42% 2.75% 2.14% 1.83%	1.56% 0.49% 0.44% 0.43%	21.07% 14.04% 11.18% 9.54%	0.10% 0.09% 0.08% 0.07%	92.39% 93.51% 94.30% 94.95%	7.61% 6.49% 5.70% 5.05%
P2 P3 P4 P5 P6 P7	1.42% 2.75% 2.14% 1.83% 1.22% 2.24%	1.56% 0.49% 0.44% 0.43% 0.43% 0.25%	21.07% 14.04% 11.18% 9.54% 8.70% 7.48%	0.10% 0.09% 0.08% 0.07% 0.06% 0.06%	92.39% 93.51% 94.30% 94.95% 95.38% 95.85%	7.61% 6.49% 5.70% 5.05% 4.62% 4.15%
P2 P3 P4 P5 P6	1.42% 2.75% 2.14% 1.83% 1.22%	1.56% 0.49% 0.44% 0.43% 0.43%	21.07% 14.04% 11.18% 9.54% 8.70%	0.10% 0.09% 0.08% 0.07% 0.06%	92.39% 93.51% 94.30% 94.95% 95.38%	7.61% 6.49% 5.70% 5.05% 4.62%

No of test	Flotation machine	Copper ore type		Particle size fraction	Type of collector	Dose of collector
10	Denver	sandstone		40-71 μm	E	150 g/Mg
Product	γ	λ	β	9	3	η
			6.13%	0.15%	0.00%	100.00%
P1	2.41%	5.35%	5.35%	0.02%	88.15%	11.85%
P2	1.31%	0.59%	3.68%	0.01%	93.39%	6.61%
P3	2.41%	0.18%	2.30%	0.01%	96.30%	3.70%
P4	1.51%	0.09%	1.87%	0.00%	97.24%	2.76%
P5	1.51%	0.10%	1.57%	0.00%	98.21%	1.79%
P6	1.61%	0.05%	1.35%	0.00%	98.81%	1.19%
P7	1.10%	0.06%	1.23%	0.00%	99.29%	0.71%
P8	1.10%	0.05%	1.13%	0.00%	99.64%	0.36%
Р9	1.41%	0.04%	1.02%	0.00%	100.00%	0.00%
Т	85.64%	0.00%	0.15%	0.00%	100.00%	0.00%
	F1 4 4*	0		Particle	т (
No of test	Flotation machine	Copper ore type		size fraction	Type of collector	Dose of collector
11	Denver	sandstone		40-71 μm	Z	100 g/Mg
Product	γ	λ	β	θ	ε	η
			24.54%	1.10%	0.00%	100.00%
P1	4.05%	23.76%	23.76%	0.14%	87.92%	12.08%
P2	0.61%	5.35%	21.36%	0.10%	90.89%	9.11%
P3	1.32%	2.85%	17.28%	0.07%	94.32%	5.68%
P4	0.71%	2.02%	15.66%	0.05%	95.63%	4.37%
P5	0.71%	1.05%	14.26%	0.04%	96.31%	3.69%
P6	0.71%	0.77%	13.08%	0.04%	96.81%	3.19%
P7	0.61%	0.70%	12.22%	0.03%	97.19%	2.81%
P8	0.41%	0.68%	11.71%	0.03%	97.44%	2.56%
Р9	0.30%	0.57%	11.35%	0.03%	97.60%	2.40%
Т	90.58%	0.03%	1.10%	0.00%	100.00%	0.00%
	Electrican	Common one		Particle	Trues of	Dose of
No of test	Flotation machine	Copper ore		size	Type of collector	collector
	machine	type		fraction	conector	conector
12	Denver	sandstone		40-71 μm	Ζ	150 g/Mg
Product	γ	λ	β	θ	8	η
			5.30%	0.18%	0.00%	100.00%
P1	2.42%	4.52%	4.52%	0.08%	59.93%	40.07%
P2	2.42%	0.92%	2.72%	0.05%	72.08%	27.92%
P3	2.22%	0.60%	2.05%	0.04%	79.31%	20.69%
P4	1.01%	0.64%	1.87%	0.03%	82.82%	17.18%
P5	0.81%	0.54%	1.75%	0.03%	85.21%	14.79%
P6	1.51%	0.25%	1.53%	0.03%	87.31%	12.69%
P7	1.72%	0.19%	1.34%	0.02%	89.10%	10.90%
P8	1.51%	0.08%	1.20%	0.02%	89.79%	10.21%
P9	1.11%	0.07%	1.12%	0.02%	90.20%	9.80%
Т	85.27%	0.02%	0.18%	0.00%	100.00%	0.00%
No of test	Flotation machine	Copper ore type		Particle size	Type of collector	Dose of collector

				fraction		
13	Denver	sandstone		71-100 μm	Ε	100 g/Mg
Product	γ	λ	β	θ	3	η
			11.49%	0.40%	0.00%	100.00%
P1	2.96%	10.71%	10.71%	0.09%	78.80%	21.20%
P2	1.95%	1.30%	6.97%	0.06%	85.10%	14.90%
P3	2.82%	0.62%	4.65%	0.05%	89.47%	10.53%
P4	1.61%	0.40%	3.92%	0.04%	91.06%	8.94%
P5	1.81%	0.29%	3.33%	0.03%	92.36%	7.64%
P6	1.68%	0.18%	2.92%	0.03%	93.09%	6.91%
P7	2.35%	0.14%	2.48%	0.03%	93.88%	6.12%
P8	1.34%	0.15%	2.29%	0.03%	94.37%	5.63%
Р9	3.29%	0.07%	1.92%	0.03%	94.91%	5.09%
Т	80.17%	0.03%	0.40%	0.00%	100.00%	0.00%
	F1	6		Particle	T (
No of test	Flotation	Copper ore		size	Type of	Dose of
	machine	type		fraction	collector	collector
14	Denver	sandstone		71-100 μm	Ε	150 g/Mg
Product	γ	λ	β	θ	3	η
			9.78%	0.44%	0.00%	100.00%
P1	3.88%	9.00%	9.00%	0.09%	80.05%	19.95%
P2	2.46%	1.19%	5.97%	0.06%	86.76%	13.24%
P3	4.36%	0.43%	3.71%	0.04%	91.06%	8.94%
P4	2.21%	0.32%	3.13%	0.04%	92.68%	7.32%
P5	2.99%	0.18%	2.58%	0.03%	93.94%	6.06%
P6	2.57%	0.14%	2.24%	0.03%	94.78%	5.22%
P7	2.78%	0.12%	1.96%	0.02%	95.53%	4.47%
P8	1.77%	0.10%	1.82%	0.02%	95.95%	4.05%
Р9	2.16%	0.06%	1.67%	0.02%	96.23%	3.77%
Т	74.81%	0.02%	0.44%	0.00%	100.00%	0.00%
	F1 4 4	6		Particle	T (
No of test	Flotation	Copper ore		size	Type of	Dose of
	machine	type		fraction	collector	collector
15	Denver	sandstone		71-100 μm	Z	100 g/Mg
Product	γ	λ	β	θ	ε	η
			6.66%	0.42%	0.00%	100.00%
P1	3.09%	5.88%	5.88%	0.25%	43.20%	56.80%
P2	1.48%	1.81%	4.57%	0.22%	49.55%	50.45%
P3	2.31%	1.10%	3.40%	0.20%	55.63%	44.37%
P4	1.95%	0.71%	2.81%	0.19%	58.93%	41.07%
P5	2.55%	0.94%	2.39%	0.17%	64.60%	35.40%
P6	2.28%	0.31%	2.04%	0.16%	66.30%	33.70%
	2.48%	0.26%	1.77%	0.16%	67.85%	32.15%
P7		0.22%	1.61%	0.16%	68.78%	31.22%
P7 P8	1.81%	0				
	1.81% 2.62%	0.16%	1.43%	0.16%	69.76%	30.24%
P8			1.43% 0.42%	0.16% 0.00%	69.76% 100.00%	0.00%
P8 P9	2.62% 79.44%	0.16% 0.16%			100.00%	0.00%
P8 P9	2.62% 79.44% Flotation	0.16% 0.16% Copper ore		0.00%	100.00% Type of	0.00% Dose of
Р8 Р9 Т	2.62% 79.44%	0.16% 0.16%		0.00% Particle	100.00%	0.00%

1100000	γ	Λ	р 6.07%	0.30%	ε 0.00%	η 100.00%
19 Product	Denver	sandstone λ	β	100-125 μm θ	Z s	100 g/Mg
10		type		fraction		
No of test	Flotation machine	Copper ore		Particle size	Type of collector	Dose of collector
Т	86.16%	0.02%	0.42%	0.00%	100.00%	0.00%
Р9	1.54%	0.08%	2.86%	0.02%	95.04%	4.96%
P8	1.37%	0.16%	3.21%	0.03%	94.73%	5.27%
P7	1.38%	0.21%	3.59%	0.03%	94.20%	5.80%
P6	1.07%	0.27%	4.08%	0.03%	93.50%	6.50%
P5	1.87%	0.29%	4.56%	0.03%	92.80%	7.20%
P4	1.34%	0.52%	5.77%	0.04%	91.50%	8.50%
P3	2.03%	0.77%	7.10%	0.04%	89.82%	10.18%
P2	1.41%	2.42%	11.05%	0.06%	86.07%	13.93%
P1	1.84%	17.68%	17.68%	0.09%	77.89%	22.11%
			18.46%	0.42%	0.00%	100.00%
Product	γ	λ	β	θ	ε	η
18	Denver	sandstone		100-125 μm	Е	150 g/Mg
No of test	machine	Copper ore type		size fraction	Type of collector	collector
	Flotation	Connor ore		Particle	Tuna of	Dose of
Т	89.76%	0.05%	0.34%	0.00%	100.00%	0.00%
Р9	1.35%	0.17%	2.89%	0.05%	87.52%	12.48%
P8	0.74%	0.30%	3.30%	0.05%	86.86%	13.14%
P7	1.14%	0.24%	3.58%	0.05%	86.20%	13.80%
P6	0.81%	0.39%	4.12%	0.05%	85.41%	14.59%
P5	1.08%	0.44%	4.61%	0.06%	84.48%	15.52%
P4	1.01%	0.70%	5.49%	0.06%	83.08%	16.92%
P3	0.88%	1.61%	6.67%	0.07%	80.99%	19.01%
P2	0.94%	3.28%	8.04%	0.08%	76.83%	23.17%
P1	2.29%	9.99%	9.99%	0.11%	67.67%	32.33%
			10.77%	0.34%	0.00%	100.00%
Product	γ	λ	β	9	ε	η
17	Denver	sandstone		100-125 μm	Е	100 g/Mg
	machine	type		fraction	collector	collector
No of test	Flotation	Copper ore		size	Type of	Dose of
Т	73.51%	0.04%	0.43%	0.00% Particle	100.00%	0.00%
P9	1.82%	0.11%	1.51%	0.04%	93.96%	6.04%
P8	1.90%	0.17%	1.61%	0.04%	93.49%	6.51%
P7	2.52%	0.21%	1.73%	0.04%	92.72%	7.28%
P6	2.42%	0.24%	1.92%	0.05%	91.50%	8.50%
P5	3.75%	0.30%	2.15%	0.05%	90.12%	9.88%
P4	2.91%	0.39%	2.65%	0.06%	87.51%	12.49%
P3	4.09%	0.54%	3.23%	0.07%	84.84%	15.16%
P2	2.84%	1.01%	4.79%	0.09%	79.69%	20.31%
P1	4.24%	7.32%	7.32%	0.12%	72.95%	27.05%
			8.10%	0.43%	0.00%	100.00%
Product	γ	λ	β	θ	ε	η

P1	1.85%	5.29%	5.29%	0.20%	32.97%	67.03%
P2	1.30%	1.65%	3.78%	0.18%	40.21%	59.79%
P3	1.92%	0.88%	2.69%	0.17%	45.89%	54.11%
P4	1.37%	0.76%	2.28%	0.16%	49.42%	50.58%
P5	2.87%	0.57%	1.75%	0.15%	54.92%	45.08%
P6	1.57%	0.35%	1.55%	0.14%	56.75%	43.25%
P7	1.57%	0.31%	1.39%	0.14%	58.39%	41.61%
P8	1.09%	0.25%	1.30%	0.14%	59.32%	40.68%
Р9	1.09%	0.25%	1.22%	0.14%	60.23%	39.77%
Т	85.36%	0.14%	0.30%	0.00%	100.00%	0.00%
				Particle		
No of test	Flotation	Copper ore		size	Type of	Dose of
	machine	type		fraction	collector	collector
20	Denver	sandstone		100-125 μm	Z	150 g/Mg
Product	γ	λ	β	9	ε	η η
	1		9.95%	0.42%	0.00%	100.00%
P1	3.30%	9.17%	9.17%	0.12%	71.64%	28.36%
P2	1.54%	2.15%	6.94%	0.09%	79.49%	20.51%
P3	2.84%	0.78%	4.66%	0.07%	84.69%	15.31%
P4	2.39%	0.50%	3.67%	0.06%	87.50%	12.50%
P5	1.98%	0.43%	3.14%	0.05%	89.52%	10.48%
P6	1.39%	0.37%	2.85%	0.05%	90.75%	9.25%
P7	1.70%	0.33%	2.57%	0.04%	92.08%	7.92%
P8	1.32%	0.26%	2.38%	0.04%	92.90%	7.10%
P9	1.19%	0.20%	2.24%	0.03%	93.47%	6.53%
T	82.36%	0.03%	0.42%	0.00%	100.00%	0.00%
1		0.0070	0.1270	Particle		
No of test	Flotation	Copper ore		size	Type of	Dose of
	machine	type		fraction	collector	collector
21	Denver	sandstone		125-200 μm	Ε	100 g/Mg
Product	γ	λ	β	9	ε	η
			12.02%	0.20%	0.00%	100.00%
P1	0.95%	11.24%	11.24%	0.09%	53.25%	46.75%
P2	0.34%	5.96%	9.85%	0.07%	63.33%	36.67%
P3	0.54%	2.79%	7.76%	0.06%	70.88%	29.12%
P4	0.34%	1.15%	6.72%	0.06%	72.83%	27.17%
P5	0.34%	0.94%	5.94%	0.05%	74.41%	25.59%
P6	0.47%	0.69%	5.11%	0.05%	76.04%	23.96%
P7	0.68%	0.52%	4.26%	0.05%	77.81%	22.19%
P8	0.47%	0.46%	3.82%	0.04%	78.91%	21.09%
Р9	0.47%	0.46%	3.48%	0.04%	80.00%	20.00%
Т	95.39%	0.04%	0.20%	0.00%	100.00%	0.00%
				Particle		
No of test	Flotation	Copper ore		size	Type of	Dose of
-	machine	type		fraction	collector	collecto
22	Denver	sandstone		125-200 μm	Ε	150 g/M
Product	γ	λ	β	θ.	ε	η
	·		12.22%	0.31%	0.00%	100.00%
P1	2.04%	11.44%	11.44%	0.07%	76.03%	23.97%
P2	0.60%	3.65%	9.67%	0.05%	83.18%	16.82%

P3	1.14%	1.16%	7.10%	0.04%	87.48%	12.52%
P4	0.91%	0.59%	5.83%	0.03%	89.23%	10.77%
P5	0.91%	0.44%	4.95%	0.03%	90.55%	9.45%
P6	0.79%	0.34%	4.38%	0.03%	91.44%	8.56%
P7	0.83%	0.27%	3.91%	0.03%	92.16%	7.84%
P8	0.84%	0.11%	3.51%	0.03%	92.46%	7.54%
P9	0.89%	0.14%	3.18%	0.02%	92.87%	7.13%
Т	91.04%	0.02%	0.31%	0.00%	100.00%	0.00%
	-1 1	6		Particle	- (
No of test	Flotation	Copper ore		size	Type of	Dose of
	machine	type		fraction	collector	collector
23	Denver	sandstone		125-200 μm	Z	100 g/Mg
Product	γ	λ	β	θ	ε	η
			9.28%	0.21%	0.00%	100.00%
P1	0.68%	8.50%	8.50%	0.16%	27.02%	72.98%
P2	0.34%	3.98%	6.99%	0.14%	33.35%	66.65%
P3	0.88%	1.65%	4.51%	0.13%	40.17%	59.83%
P4	0.68%	0.94%	3.57%	0.12%	43.15%	56.85%
P5	1.22%	0.64%	2.63%	0.12%	46.81%	53.19%
P6	1.22%	0.61%	2.14%	0.11%	50.29%	49.71%
P7	1.02%	0.60%	1.88%	0.11%	53.16%	46.84%
P8	0.88%	0.51%	1.70%	0.10%	55.26%	44.74%
Р9	0.95%	0.44%	1.55%	0.10%	57.23%	42.77%
Т	92.14%	0.10%	0.21%	0.00%	100.00%	0.00%
	Flotation	Connor oro		Particle	Type of	Dose of
No of test	machine	Copper ore		size	collector	collector
	machine	type		fraction	conector	confector
24	Denver	sandstone		125-200 μm	Z	150 g/Mg
Product	γ	λ	β	θ	ε	η
			9.11%	0.27%	0.00%	100.00%
P1	2.22%	8.33%	8.33%	0.09%	67.78%	32.22%
P2	0.92%	1.76%	6.40%	0.07%	73.74%	26.26%
P3	1.27%	1.09%	4.87%	0.06%	78.82%	21.18%
P4	1.34%	0.63%	3.88%	0.05%	81.90%	18.10%
P5	1.08%	0.56%	3.35%	0.05%	84.14%	15.86%
P6	0.60%	0.64%	3.14%	0.04%	85.55%	14.45%
P7	0.91%	0.50%	2.85%	0.04%	87.22%	12.78%
P8	0.77%	0.44%	2.64%	0.03%	88.45%	11.55%
Р9	0.67%	0.35%	2.49%	0.03%	89.33%	10.67%
Т	90.21%	0.03%	0.27%	0.00%	100.00%	0.00%

Table A2. Averaged results of flotation test of dolomite copper ore in Denver flotation machine (E – water solution of ethyl sodium xanthate; Z – water solution of isobutyl sodium xanthate)

No of test	Flotation machine	Copper ore type		Particle size fraction	Type of collector	Dose of collector
25	Denver	dolomite		0-20 μm	Ε	100 g/Mg
Product	γ	λ	β	θ	ε	η
			5.42%	0.93%	0.00%	100.00%
P1	13.27%	4.64%	4.64%	0.36%	66.45%	33.55%
P2	5.41%	1.42%	3.71%	0.29%	74.75%	25.25%

P3	14.87%	0.71%	2.38%	0.19%	86.17%	13.83%
P4	7.72%	0.38%	2.00%	0.17%	89.33%	10.67%
P5	8.99%	0.28%	1.70%	0.15%	92.08%	7.92%
P6	5.91%	0.29%	1.55%	0.13%	93.91%	6.09%
P7	7.18%	0.22%	1.40%	0.11%	95.62%	4.38%
P8	6.42%	0.17%	1.28%	0.10%	96.77%	3.23%
P9	4.26%	0.14%	1.22%	0.09%	97.39%	2.61%
Т	25.97%	0.09%	0.93%	0.00%	100.00%	0.00%
	Flotation	Copper ore	0.9070	Particle size	Type of	Dose of
No of test	machine	type		fraction	collector	collector
26	Denver	dolomite		0-20 μm	Е	150 g/Mg
Product	γ	λ	β	9. 9	ε	η
			4.75%	0.93%	0.00%	100.00%
P1	16.18%	3.97%	3.97%	0.34%	68.99%	31.01%
P2	8.27%	1.24%	3.05%	0.25%	79.96%	20.04%
P3	9.72%	0.60%	2.35%	0.19%	86.23%	13.77%
P4	6.16%	0.45%	2.06%	0.17%	89.19%	10.81%
P5	8.55%	0.31%	1.75%	0.15%	91.99%	8.01%
P6	6.42%	0.26%	1.58%	0.13%	93.81%	6.19%
Р7	6.67%	0.20%	1.43%	0.11%	95.33%	4.67%
P8	3.56%	0.21%	1.45%	0.10%	96.27%	3.73%
P9	4.81%	0.23%	1.29%	0.09%	97.17%	2.83%
T	4.81 % 29.65%	0.17 %	0.93%	0.09%	100.00%	0.00%
1	Flotation	Copper ore	0.93 /6	Particle size	Type of	Dose of
No of test	machine	type		fraction	collector	collector
27	Denver	dolomite				100 g/Mg
				0-20 um	1 .	
Product			ß	0-20 μm ອ	Z ε	
Product	γ	λ	β 5 40%	θ	ε	η
	γ	λ	5.40%	9 0.22%	ε 0.00%	η 100.00%
P1	γ 4.62%	λ 4.62%	5.40% 4.62%) 0.22% 0.01%	ε 0.00% 6.62%	η 100.00% 93.38%
P1 P2	γ 4.62% 0.75%	λ 4.62% 0.75%	5.40% 4.62% 4.08%	9 0.22% 0.01% 0.00%	ε 0.00% 6.62% 6.80%	η 100.00% 93.38% 93.20%
P1 P2 P3	γ 4.62% 0.75% 0.33%	λ 4.62% 0.75% 0.33%	5.40% 4.62% 4.08% 3.86%	80.22%0.01%0.00%0.00%	ε 0.00% 6.62% 6.80% 6.83%	η 100.00% 93.38% 93.20% 93.17%
P1 P2 P3 P4	γ 4.62% 0.75% 0.33% 0.23%	λ 4.62% 0.75% 0.33% 0.23%	5.40% 4.62% 4.08% 3.86% 3.72%	 (a) (b) (c) (c)	ε 0.00% 6.62% 6.80% 6.83% 6.85%	η 100.00% 93.38% 93.20% 93.17% 93.15%
P1 P2 P3 P4 P5	γ 4.62% 0.75% 0.33% 0.23% 0.20%	λ 4.62% 0.75% 0.33% 0.23% 0.20%	5.40% 4.62% 4.08% 3.86% 3.72% 3.60%	 (a) (b) (c) (c)	ε 0.00% 6.62% 6.80% 6.83% 6.85% 6.85%	η 100.00% 93.38% 93.20% 93.17% 93.15% 93.14%
P1 P2 P3 P4 P5 P6	γ 4.62% 0.75% 0.33% 0.23% 0.20% 0.19%	λ 4.62% 0.75% 0.33% 0.23% 0.20% 0.19%	5.40% 4.62% 4.08% 3.86% 3.72% 3.60% 3.50%	 Q 0.22% 0.01% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00% 	ε 0.00% 6.62% 6.80% 6.83% 6.85% 6.86% 6.86%	η 100.00% 93.38% 93.20% 93.17% 93.15% 93.14% 93.13%
P1 P2 P3 P4 P5 P6 P7	γ 4.62% 0.75% 0.33% 0.23% 0.20% 0.19% 0.21%	λ 4.62% 0.75% 0.33% 0.23% 0.20% 0.19% 0.21%	5.40% 4.62% 4.08% 3.86% 3.72% 3.60% 3.50% 3.40%	 (a) (b) (c) (c)	ε 0.00% 6.62% 6.80% 6.83% 6.85% 6.86% 6.86% 6.87% 6.89%	η 100.00% 93.38% 93.20% 93.17% 93.15% 93.15% 93.14% 93.13%
P1 P2 P3 P4 P5 P6 P7 P8	γ 4.62% 0.75% 0.33% 0.23% 0.20% 0.19% 0.21% 0.15%	λ 4.62% 0.75% 0.33% 0.23% 0.20% 0.19% 0.21% 0.15%	5.40% 4.62% 4.08% 3.86% 3.72% 3.60% 3.50% 3.40% 3.32%	8 0.22% 0.01% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00%	ε 0.00% 6.62% 6.80% 6.83% 6.85% 6.85% 6.86% 6.87% 6.89% 6.89%	η 100.00% 93.38% 93.20% 93.17% 93.15% 93.14% 93.13% 93.11%
P1 P2 P3 P4 P5 P6 P7 P8 P9	γ 4.62% 0.75% 0.33% 0.23% 0.20% 0.19% 0.21% 0.15% 0.11%	λ 4.62% 0.75% 0.33% 0.23% 0.20% 0.19% 0.21% 0.15% 0.11%	5.40% 4.62% 4.08% 3.86% 3.72% 3.60% 3.60% 3.50% 3.40% 3.32% 3.27%	 (a) (b) (c) (c)	ε 0.00% 6.62% 6.80% 6.83% 6.85% 6.86% 6.87% 6.89% 6.89% 6.89%	η 100.00% 93.38% 93.20% 93.17% 93.15% 93.14% 93.13% 93.11% 93.11% 93.11%
P1 P2 P3 P4 P5 P6 P7 P8	γ 4.62% 0.75% 0.33% 0.23% 0.20% 0.19% 0.21% 0.15% 0.11% 0.10%	λ 4.62% 0.75% 0.33% 0.23% 0.20% 0.19% 0.21% 0.15% 0.11% 0.11%	5.40% 4.62% 4.08% 3.86% 3.72% 3.60% 3.50% 3.40% 3.32%	 (a) (b) (c) (c)	ε 0.00% 6.62% 6.80% 6.83% 6.85% 6.86% 6.87% 6.89% 6.89% 6.89% 6.90%	η 100.00% 93.38% 93.20% 93.17% 93.15% 93.14% 93.13% 93.11% 93.11% 93.10%
P1 P2 P3 P4 P5 P6 P7 P8 P9	γ 4.62% 0.75% 0.33% 0.23% 0.20% 0.19% 0.21% 0.15% 0.11% 0.10% Flotation	λ 4.62% 0.75% 0.33% 0.23% 0.20% 0.19% 0.21% 0.15% 0.11% 0.10% Copper ore	5.40% 4.62% 4.08% 3.86% 3.72% 3.60% 3.60% 3.50% 3.40% 3.32% 3.27%	8 0.22% 0.01% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00%	ε 0.00% 6.62% 6.80% 6.83% 6.85% 6.85% 6.86% 6.87% 6.89% 6.89% 6.89% 6.90% 6.90% Type of	η 100.00% 93.38% 93.20% 93.17% 93.15% 93.14% 93.14% 93.11% 93.11% 93.10% 93.10% 93.10% Dose of
P1 P2 P3 P4 P5 P6 P7 P8 P9 T No of test	γ 4.62% 0.75% 0.33% 0.23% 0.20% 0.19% 0.21% 0.15% 0.15% 0.11% 0.10% Flotation machine	λ 4.62% 0.75% 0.33% 0.23% 0.20% 0.19% 0.21% 0.15% 0.15% 0.11% 0.10% Copper ore type	5.40% 4.62% 4.08% 3.86% 3.72% 3.60% 3.60% 3.50% 3.40% 3.32% 3.27%	8 0.22% 0.01% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00% Particle size fraction	ε 0.00% 6.62% 6.80% 6.83% 6.85% 6.86% 6.87% 6.89% 6.89% 6.89% 6.90% Type of collector	η 100.00% 93.38% 93.20% 93.17% 93.15% 93.14% 93.14% 93.11% 93.11% 93.11% 93.10% 93.10% 93.10% Dose of collector
P1 P2 P3 P4 P5 P6 P7 P8 P9 T No of test	γ 4.62% 0.75% 0.33% 0.23% 0.20% 0.19% 0.21% 0.15% 0.11% 0.11% 0.10% Flotation machine Denver	λ 4.62% 0.75% 0.33% 0.23% 0.20% 0.19% 0.21% 0.15% 0.11% 0.11% 0.10% Copper ore type dolomite	5.40% 4.62% 4.08% 3.86% 3.72% 3.60% 3.50% 3.50% 3.32% 3.22%	θ 0.22% 0.01% 0.00% Particle size fraction 0-20 μm	ε 0.00% 6.62% 6.80% 6.83% 6.85% 6.86% 6.87% 6.89% 6.89% 6.90% 6.90% Type of collector Z	η 100.00% 93.38% 93.20% 93.17% 93.15% 93.14% 93.14% 93.11% 93.11% 93.10% 93.10% 93.10% Dose of collector 150 g/Mg
P1 P2 P3 P4 P5 P6 P7 P8 P9 T No of test	γ 4.62% 0.75% 0.33% 0.23% 0.20% 0.19% 0.21% 0.15% 0.15% 0.11% 0.10% Flotation machine	λ 4.62% 0.75% 0.33% 0.23% 0.20% 0.19% 0.21% 0.15% 0.15% 0.11% 0.10% Copper ore type	5.40% 4.62% 4.08% 3.86% 3.72% 3.60% 3.50% 3.40% 3.32% 3.22%	θ 0.22% 0.01% 0.00%	ε 0.00% 6.62% 6.80% 6.83% 6.85% 6.86% 6.87% 6.89% 6.89% 6.90% 6.90% Type of collector Z	η 100.00% 93.38% 93.20% 93.17% 93.15% 93.14% 93.14% 93.11% 93.11% 93.11% 93.10% 93.10% 93.10% 93.10% Dose of collector 150 g/Mg
P1 P2 P3 P4 P5 P6 P7 P8 P9 T No of test 28 Product	γ 4.62% 0.75% 0.33% 0.23% 0.20% 0.19% 0.21% 0.15% 0.11% 0.15% 0.11% 0.10% Flotation machine Denver γ	λ 4.62% 0.75% 0.33% 0.23% 0.20% 0.19% 0.21% 0.15% 0.15% 0.11% 0.10% Copper ore type dolomite $λ$	5.40% 4.62% 4.08% 3.86% 3.72% 3.60% 3.50% 3.40% 3.32% 3.22% β 5.56%	θ 0.22% 0.01% 0.00%	ε 0.00% 6.62% 6.80% 6.83% 6.85% 6.86% 6.87% 6.89% 6.89% 6.90% 6.90% Type of collector Z ε 0.00%	η 100.00% 93.38% 93.20% 93.17% 93.15% 93.14% 93.14% 93.13% 93.11% 93.11% 93.10% 93.10% 93.10% 93.10% Dose of collector 150 g/Mg η 100.00%
P1 P2 P3 P4 P5 P6 P7 P8 P9 T No of test 28 Product	γ 4.62% 0.75% 0.33% 0.23% 0.20% 0.19% 0.21% 0.15% 0.11% 0.15% 0.11% 0.10% Flotation machine Denver γ 13.68%	λ 4.62% 0.75% 0.33% 0.23% 0.20% 0.19% 0.21% 0.15% 0.11% 0.11% 0.10% Copper ore type dolomite $λ$ 4.78%	5.40% 4.62% 4.08% 3.86% 3.72% 3.60% 3.50% 3.40% 3.32% 3.22% β 5.56% 4.78%	θ 0.22% 0.01% 0.00%	ε 0.00% 6.62% 6.80% 6.83% 6.85% 6.86% 6.87% 6.89% 6.89% 6.90% 6.90% Type of collector Z ε 0.00% 74.80%	η 100.00% 93.38% 93.20% 93.17% 93.15% 93.14% 93.13% 93.11% 93.11% 93.10% 93.10% 93.10% 005e of collector 150 g/Mg η 100.00% 25.20%
P1 P2 P3 P4 P5 P6 P7 P8 P9 T No of test 28 Product	γ 4.62% 0.75% 0.33% 0.23% 0.20% 0.19% 0.21% 0.19% 0.15% 0.11% 0.10% Flotation machine Denver γ 13.68% 12.68%	λ 4.62% 0.75% 0.33% 0.23% 0.20% 0.19% 0.21% 0.15% 0.11% 0.10% Copper ore type dolomite $λ$ 4.78% 0.59%	5.40% 4.62% 4.08% 3.86% 3.72% 3.60% 3.50% 3.40% 3.32% 3.22% β 5.56% 4.78% 2.76%		ε 0.00% 6.62% 6.80% 6.83% 6.85% 6.86% 6.87% 6.89% 6.89% 6.90% 74.80% 83.33%	 η 100.00% 93.38% 93.20% 93.17% 93.15% 93.14% 93.14% 93.11% 93.11% 93.10% 93.10% 93.10% Dose of collector 150 g/Mg η 100.00% 25.20% 16.67%
P1 P2 P3 P4 P5 P6 P7 P8 P9 T No of test 28 Product P1 P2 P3	γ 4.62% 0.75% 0.33% 0.23% 0.20% 0.19% 0.21% 0.15% 0.11% 0.15% 0.11% 0.10% Flotation machine Denver γ 13.68% 12.68% 14.07%	λ 4.62% 0.75% 0.33% 0.23% 0.20% 0.19% 0.21% 0.15% 0.11% 0.10% Copper ore type dolomite $λ$ 4.78% 0.59% 0.33%	5.40% 4.62% 4.08% 3.86% 3.72% 3.60% 3.50% 3.40% 3.32% 3.22% β 5.56% 4.78% 2.76% 1.91%		 ε 0.00% 6.62% 6.80% 6.85% 6.86% 6.87% 6.89% 6.90% 6.90% 5.90% 74.80% 83.33% 88.57% 	 η 100.00% 93.38% 93.20% 93.17% 93.15% 93.14% 93.13% 93.11% 93.11% 93.10% 93.10% 93.10% Dose of collector 150 g/Mg η 100.00% 25.20% 16.67% 11.43%
P1 P2 P3 P4 P5 P6 P7 P8 P9 T No of test 28 Product P1 P2 P3 P3 P3	γ 4.62% 0.75% 0.33% 0.23% 0.20% 0.19% 0.21% 0.15% 0.11% 0.15% 0.11% 0.10% Flotation machine Denver γ 13.68% 12.68% 14.07% 11.35%	λ 4.62% 0.75% 0.33% 0.23% 0.20% 0.19% 0.21% 0.15% 0.11% 0.10% Copper ore type dolomite $λ$ 4.78% 0.59% 0.33% 0.25%	5.40% 4.62% 4.08% 3.86% 3.72% 3.60% 3.50% 3.40% 3.32% 3.27% 3.22% β 5.56% 4.78% 2.76% 1.91% 1.55%	θ 0.22% 0.01% 0.00% 0.20 0.26% 0.20% 0.17% 0.15%	 ε 0.00% 6.62% 6.80% 6.85% 6.85% 6.86% 6.87% 6.89% 6.90% 6.90% 6.90% 742 ε 0.00% 74.80% 83.33% 88.57% 91.80% 	 η 100.00% 93.38% 93.20% 93.17% 93.15% 93.14% 93.13% 93.11% 93.11% 93.10% 93.10% Dose of collector 150 g/Mg η 100.00% 25.20% 16.67% 11.43% 8.20%
P1 P2 P3 P4 P5 P6 P7 P8 P9 T No of test 28 Product P1 P2 P3 P4 P4 P5	γ 4.62% 0.75% 0.33% 0.23% 0.20% 0.19% 0.21% 0.19% 0.15% 0.11% 0.10% Flotation machine Denver γ 13.68% 12.68% 14.07% 11.35% 8.94%	λ 4.62% 0.75% 0.33% 0.23% 0.20% 0.19% 0.21% 0.15% 0.11% 0.10% Copper ore type dolomite $λ$ 4.78% 0.59% 0.33% 0.25% 0.22%	5.40% 4.62% 4.08% 3.86% 3.72% 3.60% 3.50% 3.40% 3.32% 3.22% 3.22% β 5.56% 4.78% 2.76% 1.91% 1.55% 1.35%		 ε 0.00% 6.62% 6.80% 6.85% 6.85% 6.86% 6.89% 6.90% 6.90% 74.80% 83.33% 88.57% 91.80% 94.00% 	 η 100.00% 93.38% 93.20% 93.17% 93.15% 93.14% 93.13% 93.11% 93.10% 93.10% 93.10% 93.10% 93.10% 100% 25.20% 16.67% 11.43% 8.20% 6.00%
P1 P2 P3 P4 P5 P6 P7 P8 P9 T No of test 28 Product P1 P2 P3 P3 P4 P5 P6	γ 4.62% 0.75% 0.33% 0.23% 0.20% 0.19% 0.21% 0.15% 0.11% 0.11% 0.10% Flotation machine Denver $γ$ 13.68% 12.68% 14.07% 11.35% 8.94% 7.34%	λ 4.62% 0.75% 0.33% 0.23% 0.20% 0.19% 0.21% 0.15% 0.11% 0.11% 0.10% Copper ore type dolomite $λ$ 4.78% 0.59% 0.33% 0.25% 0.22% 0.17%	5.40% 4.62% 4.08% 3.86% 3.72% 3.60% 3.50% 3.40% 3.32% 3.27% 3.22% 5.56% 4.78% 2.76% 1.91% 1.55% 1.35% 1.22%		 ε 0.00% 6.62% 6.80% 6.85% 6.86% 6.87% 6.89% 6.90% 6.90% 74ype of collector Z ε 0.00% 74.80% 83.33% 88.57% 91.80% 94.00% 95.43% 	 η 100.00% 93.38% 93.20% 93.17% 93.15% 93.14% 93.13% 93.11% 93.11% 93.10% 93.10% 93.10% 00.00% 25.20% 16.67% 11.43% 8.20% 6.00% 4.57%
P1 P2 P3 P4 P5 P6 P7 P8 P9 T No of test 28 Product P1 P2 P3 P4 P4 P5	γ 4.62% 0.75% 0.33% 0.23% 0.20% 0.19% 0.21% 0.19% 0.15% 0.11% 0.10% Flotation machine Denver γ 13.68% 12.68% 14.07% 11.35% 8.94%	λ 4.62% 0.75% 0.33% 0.23% 0.20% 0.19% 0.21% 0.15% 0.11% 0.10% Copper ore type dolomite $λ$ 4.78% 0.59% 0.33% 0.25% 0.22%	5.40% 4.62% 4.08% 3.86% 3.72% 3.60% 3.50% 3.40% 3.32% 3.22% 3.22% β 5.56% 4.78% 2.76% 1.91% 1.55% 1.35%		 ε 0.00% 6.62% 6.80% 6.85% 6.85% 6.86% 6.89% 6.90% 6.90% 74.80% 83.33% 88.57% 91.80% 94.00% 	 η 100.00% 93.38% 93.20% 93.17% 93.15% 93.14% 93.13% 93.11% 93.10% 93.20% 6.00%

Р9	3.18%	0.16%	1.09%	0.11%	97.39%	2.61%
Т	21.76%	0.11%	0.87%	0.00%	100.00%	0.00%
No of test	Flotation	Copper ore		Particle size	Type of	Dose of
No of test	machine	type		fraction	collector	collector
29	Denver	dolomite		20-40 µm	Ε	100 g/Mg
Product	γ	λ	β	θ	ε	η
			14.58%	1.40%	0.00%	100.00%
P1	8.47%	13.80%	13.80%	0.25%	83.45%	16.55%
P2	5.34%	1.20%	8.93%	0.19%	88.03%	11.97%
P3	4.08%	1.01%	7.12%	0.15%	90.98%	9.02%
P4	2.92%	0.58%	6.20%	0.14%	92.19%	7.81%
P5	3.88%	0.53%	5.31%	0.12%	93.66%	6.34%
P6	2.67%	0.41%	4.83%	0.11%	94.44%	5.56%
P7	2.52%	0.38%	4.46%	0.10%	95.12%	4.88%
P8	3.07%	0.29%	4.07%	0.09%	95.76%	4.24%
Р9	3.38%	0.25%	3.71%	0.08%	96.36%	3.64%
Т	63.66%	0.08%	1.40%	0.00%	100.00%	0.00%
Negfield	Flotation	Copper ore		Particle size	Type of	Dose of
No of test	machine	type		fraction	collector	collector
30	Denver	dolomite		20-40 μm	Е	150 g/Mg
Product	γ	λ	β	θ	ε	η
			13.23%	1.20%	0.00%	100.00%
P1	7.84%	12.45%	12.45%	0.24%	81.34%	18.66%
P2	6.92%	0.98%	7.07%	0.18%	86.99%	13.01%
P3	3.54%	0.93%	5.89%	0.15%	89.73%	10.27%
P4	3.23%	0.49%	5.07%	0.14%	91.04%	8.96%
P5	4.80%	0.43%	4.23%	0.12%	92.74%	7.26%
P6	2.29%	0.32%	3.91%	0.11%	93.34%	6.66%
P7	2.02%	0.35%	3.68%	0.11%	93.93%	6.07%
P8	2.23%	0.23%	3.45%	0.10%	94.36%	5.64%
Р9	3.28%	0.22%	3.15%	0.10%	94.95%	5.05%
Т	63.84%	0.10%	1.20%	0.00%	100.00%	0.00%
No. of tool	Flotation	Copper ore		Particle size	Type of	Dose of
No of test	machine	type		fraction	collector	collector
31	Denver	dolomite		20-40 µm	Z	100 g/Mg
Product	γ	λ	β	θ	ε	η
			14.33%	1.07%	0.00%	100.00%
P1	6.25%	13.55%	13.55%	0.24%	79.00%	21.00%
P2	3.23%	1.58%	9.48%	0.19%	83.76%	16.24%
P3	3.46%	0.89%	7.18%	0.16%	86.63%	13.37%
P4	3.06%	0.62%	5.93%	0.15%	88.39%	11.61%
P5	2.98%	0.47%	5.07%	0.14%	89.71%	10.29%
P6	1.62%	0.38%	4.70%	0.13%	90.28%	9.72%
P7	2.16%	0.28%	4.28%	0.13%	90.85%	9.15%
DO	2.02%	0.24%	3.95%	0.12%	91.31%	8.69%
P8		0.21%	3.60%	0.12%	91.81%	8.19%
P8 P9	2.55%	0.21/0		0.000/	100.00%	0.00%
	2.55% 72.65%	0.12%	1.07%	0.00%	100.00%	0.00 /0
P9 T			1.07%	0.00% Particle size	Type of	
P9 T	72.65%	0.12%	1.07%			Dose of
Р9	72.65% Flotation	0.12% Copper ore	1.07%	Particle size	Type of	Dose of collector 150 g/Mg

Р5

2.37%

1.12%

6.85%

0.27%

81.77%

18.23%

			17.59%	1.05%	0.00%	100.00%
P1	4.73%	16.81%	16.81%	0.27%	75.81%	24.19%
P2	2.91%	2.20%	11.25%	0.21%	81.90%	18.10%
P3	3.03%	0.98%	8.33%	0.18%	84.74%	15.26%
P4	3.43%	0.65%	6.46%	0.16%	86.87%	13.13%
P5	3.35%	0.50%	5.32%	0.15%	88.47%	11.53%
P6	2.78%	0.39%	4.64%	0.14%	89.50%	10.50%
P7	3.06%	0.31%	4.07%	0.13%	90.41%	9.59%
P8	2.90%	0.27%	3.65%	0.13%	91.15%	8.85%
P9	4.20%	0.22%	3.18%	0.12%	92.03%	7.97%
Т	69.62%	0.12%	1.05%	0.00%	100.00%	0.00%
	Flotation	Copper ore		Particle size	Type of	Dose of
No of test	machine	type		fraction	collector	collector
33	Denver	dolomite		40-71 μm	Ε	100 g/Mg
Product	γ	λ	β	θ	ε	η
			14.32%	1.23%	0.00%	100.00%
P1	6.41%	13.54%	13.54%	0.39%	70.67%	29.33%
P2	5.81%	2.30%	8.20%	0.26%	81.54%	18.46%
P3	4.21%	1.36%	6.44%	0.20%	86.21%	13.79%
P4	4.16%	0.98%	5.34%	0.16%	89.52%	10.48%
P5	2.61%	0.96%	4.85%	0.14%	91.56%	8.44%
P6	1.65%	0.71%	4.57%	0.12%	92.51%	7.49%
P7	2.20%	0.54%	4.25%	0.11%	93.48%	6.52%
P8	2.55%	0.41%	3.91%	0.10%	94.34%	5.66%
P9	2.61%	0.33%	3.62%	0.09%	95.04%	4.96%
Т	67.78%	0.09%	1.23%	0.00%	100.00%	0.00%
	Flotation	Copper ore		Particle size	Type of	Dose of
No of test	machine	type		fraction	collector	collector
34	Denver	dolomite		40-71 μm	Ε	150 g/Mg
Product	γ	λ	β	θ	ε	η
			12.92%	1.21%	0.00%	100.00%
P1	6.93%	12.14%	12.14%	0.39%	69.70%	30.30%
P2	5.55%	1.77%	7.52%	0.31%	77.83%	22.17%
P3	4.44%	1.20%	5.86%	0.26%	82.25%	17.75%
P4	3.33%	0.88%	5.04%	0.23%	84.67%	15.33%
P5	1.89%	0.87%	4.68%	0.22%	86.03%	13.97%
P6	1.91%	0.63%	4.36%	0.21%	87.03%	12.97%
P7	2.51%	0.50%	4.00%	0.20%	88.06%	11.94%
P8	2.25%	0.35%	3.71%	0.19%	88.72%	11.28%
Р9	2.98%	0.24%	3.39%	0.19%	89.31%	10.69%
Т	68.20%	0.19%	1.21%	0.00%	100.00%	0.00%
N. (Flotation	Copper ore		Particle size	Type of	Dose of
No of test	machine	type		fraction	collector	collector
35	Denver	dolomite		40-71 μm	Z	100 g/Mg
Product	γ	λ	β	θ	З	η
			14.93%	1.27%	0.00%	100.00%
P1	6.09%	14.15%	14.15%	0.43%	67.93%	32.07%
P2	2.04%	3.56%	11.50%	0.36%	73.65%	26.35%
P3	2.33%	1.94%	9.37%	0.32%	77.22%	22.78%
P4	2.31%	1.35%	7.92%	0.30%	79.68%	20.32%
				2.2070		

P61.10%1.16%6.47%0.26%82.77%P72.38%0.78%5.74%0.25%84.25%P81.96%0.69%5.26%0.23%85.17%P92.10%0.52%4.82%0.23%86.17%T77.33%0.23%4.82%0.00%100.00%No of testFloation machineCopper or typeParticle sizeType of fraction736Denverdolomite40-71 µmZP70duct γ λ β ϱ ρ P16.14%13.21%13.21%0.04%66.25%P22.96%2.92%9.86%0.36%73.30%P33.30%1.78%7.71%0.31%78.08%P42.10%1.33%6.79%0.28%80.36%P51.96%0.93%6.09%0.27%81.58%P61.48%0.77%5.31%0.25%83.58%P71.34%0.74%5.31%0.25%83.58%P81.20%0.65%5.04%0.24%84.25%P91.10%0.68%4.82%0.24%84.83%P17.14%0.06%5.34%0.24%84.83%P29.86%0.24%84.5%5.24%P31.00%6.09%0.24%84.25%P42.10%0.65%5.04%0.25%85.8%P51.34%0.74%5.31%0.25%85.8%P61.26% <th>2.38% 0.78% 5.74% 0.25% 1.96% 0.69% 5.26% 0.23% 2.10% 0.52% 4.82% 0.23% 77.33% 0.23% 1.27% 0.00% lotation Copper ore type Particle siz fraction Denver dolomite 40-71 μm γ λ β 9 13.99% 1.22% 6.14% 13.21% 0.44%</th> <th>84.25% 15.75% 85.31% 14.69% 86.17% 13.83% 100.00% 0.00% P Type of collector Collector collector Z 150 g/Mg ε η</th>	2.38% 0.78% 5.74% 0.25% 1.96% 0.69% 5.26% 0.23% 2.10% 0.52% 4.82% 0.23% 77.33% 0.23% 1.27% 0.00% lotation Copper ore type Particle siz fraction Denver dolomite 40-71 μm γ λ β 9 13.99% 1.22% 6.14% 13.21% 0.44%	84.25% 15.75% 85.31% 14.69% 86.17% 13.83% 100.00% 0.00% P Type of collector Collector collector Z 150 g/Mg ε η
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P17.11%10.10%10.10%0.58%57.08%P23.04%3.20%8.03%0.49%64.81%P37.64%1.50%5.23%0.40%73.93%P45.23%1.00%4.27%0.36%78.09%P55.36%0.79%3.61%0.33%81.46%P63.55%0.68%3.28%0.31%83.38%P74.59%0.55%2.94%0.29%85.39%P81.74%0.57%2.83%0.28%86.18%P94.79%0.42%2.56%0.27%87.78%T56.93%0.27%1.26%0.00%100.00%No of testFlotation machineCopper ore typeParticle size fractionType of collector38Denverdolomite71-100 µmEProduct γ λ β ϑ ε		E 100 g/Mg
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P2 3.04% 3.20% 8.03% 0.49% 64.81% P3 7.64% 1.50% 5.23% 0.40% 73.93% P4 5.23% 1.00% 4.27% 0.36% 78.09% P5 5.36% 0.79% 3.61% 0.33% 81.46% P6 3.55% 0.68% 3.28% 0.31% 83.38% P7 4.59% 0.55% 2.94% 0.29% 85.39% P8 1.74% 0.57% 2.83% 0.28% 86.18% P9 4.79% 0.42% 2.56% 0.27% 87.78% T 56.93% 0.27% 1.26% 0.00% 100.00% No of testFlotation machinetype Flotation typetype of fractionType of collector38Denverdolomite71-100 μ mEProduct γ λ β ϑ ε	· · · · ·	
P37.64%1.50%5.23%0.40%73.93%P45.23%1.00%4.27%0.36%78.09%P55.36%0.79%3.61%0.33%81.46%P63.55%0.68%3.28%0.31%83.38%P74.59%0.55%2.94%0.29%85.39%P81.74%0.57%2.83%0.28%86.18%P94.79%0.42%2.56%0.27%87.78%T56.93%0.27%1.26%0.00%100.00%No of testFlotation machineCopper ore typeParticle size fractionType of collector38Denverdolomite71-100 µmEProduct γ λ β ϑ ε	7.11% 10.10% 10.10% 0.58%	57.08% 42.92%
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P55.36%0.79%3.61%0.33%81.46%P63.55%0.68%3.28%0.31%83.38%P74.59%0.55%2.94%0.29%85.39%P81.74%0.57%2.83%0.28%86.18%P94.79%0.42%2.56%0.27%87.78%T56.93%0.27%1.26%0.00%100.00%No of testFlotation machineCopper ore typeParticle size fractionType of collector38Denverdolomite71-100 μ mEProduct γ λ β ϑ ε	7.64% 1.50% 5.23% 0.40%	73.93% 26.07%
P6 3.55% 0.68% 3.28% 0.31% 83.38% P7 4.59% 0.55% 2.94% 0.29% 85.39% P8 1.74% 0.57% 2.83% 0.28% 86.18% P9 4.79% 0.42% 2.56% 0.27% 87.78% T 56.93% 0.27% 1.26% 0.00% 100.00% No of test Flotation machine type Copper ore type Particle size fraction Type of collector 38 Denver dolomite 71-100 µm E Product γ λ β ϑ ε	5.23% 1.00% 4.27% 0.36%	78.09% 21.91%
P7 4.59% 0.55% 2.94% 0.29% 85.39% P8 1.74% 0.57% 2.83% 0.28% 86.18% P9 4.79% 0.42% 2.56% 0.27% 87.78% T 56.93% 0.27% 1.26% 0.00% 100.00% No of test Flotation machine Copper ore type Particle size fraction Type of collector 38 Denver dolomite 71-100 µm E Product γ λ β ϑ ε	5.36% 0.79% 3.61% 0.33%	81.46% 18.54%
P7 4.59% 0.55% 2.94% 0.29% 85.39% P8 1.74% 0.57% 2.83% 0.28% 86.18% P9 4.79% 0.42% 2.56% 0.27% 87.78% T 56.93% 0.27% 1.26% 0.00% 100.00% No of test Flotation machine Copper ore type Particle size fraction Type of collector 38 Denver dolomite 71-100 µm E Product γ λ β ϑ ε		83.38% 16.62%
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No of testFlotation machineCopper ore typeParticle size fractionType of 38Denverdolomite71-100 μ mEProduct γ λ β ϑ ε		
No of testmachinetypefractioncollector38Denverdolomite71-100 μ mEProduct γ λ β ϑ ε		
Product γ λ β ϑ ε	**	71
· · ·	Denver dolomite 71-100 μm	E 150 g/Mg
	$\lambda = \rho$	ε η
	γ Λ ρ θ	0.00% 100.00%
P1 8.23% 8.80% 8.80% 0.57% 57.94%	· ·	
P2 5.76% 2.06% 6.03% 0.47% 67.42%	9.58% 1.25%	57.94% 42.06%
P3 7.87% 1.31% 4.33% 0.39% 75.66%	9.58% 1.25% 8.23% 8.80% 8.80% 0.57%	
	9.58% 1.25% 8.23% 8.80% 8.80% 0.57% 5.76% 2.06% 6.03% 0.47%	67.42% 32.58%
	9.58% 1.25% 8.23% 8.80% 8.80% 0.57% 5.76% 2.06% 6.03% 0.47% 7.87% 1.31% 4.33% 0.39%	67.42%32.58%75.66%24.34%
	9.58% 1.25% 8.23% 8.80% 8.80% 0.57% 5.76% 2.06% 6.03% 0.47% 7.87% 1.31% 4.33% 0.39% 5.19% 0.87% 3.67% 0.36%	67.42%32.58%75.66%24.34%79.27%20.73%
	9.58% 1.25% 8.23% 8.80% 8.80% 0.57% 5.76% 2.06% 6.03% 0.47% 7.87% 1.31% 4.33% 0.39% 5.19% 0.87% 3.67% 0.36% 4.25% 0.75% 3.27% 0.33%	67.42%32.58%75.66%24.34%79.27%20.73%81.82%18.18%
	9.58% 1.25% 8.23% 8.80% 8.80% 0.57% 5.76% 2.06% 6.03% 0.47% 7.87% 1.31% 4.33% 0.39% 5.19% 0.87% 3.67% 0.36% 4.25% 0.75% 3.27% 0.33% 4.35% 0.62% 2.95% 0.31%	67.42%32.58%75.66%24.34%79.27%20.73%81.82%18.18%83.97%16.03%
	9.58% 1.25% 8.23% 8.80% 8.80% 0.57% 5.76% 2.06% 6.03% 0.47% 7.87% 1.31% 4.33% 0.39% 5.19% 0.87% 3.67% 0.36% 4.25% 0.75% 3.27% 0.33% 4.35% 0.62% 2.95% 0.31% 3.83% 0.58% 2.72% 0.29%	67.42%32.58%75.66%24.34%79.27%20.73%81.82%18.18%83.97%16.03%85.75%14.25%
	9.58% 1.25% 8.23% 8.80% 8.80% 0.57% 5.76% 2.06% 6.03% 0.47% 7.87% 1.31% 4.33% 0.39% 5.19% 0.87% 3.67% 0.36% 4.25% 0.75% 3.27% 0.33% 4.35% 0.62% 2.95% 0.31% 3.83% 0.58% 2.72% 0.29% 3.41% 0.48% 2.54% 0.28%	67.42%32.58%75.66%24.34%79.27%20.73%81.82%18.18%83.97%16.03%85.75%14.25%87.06%12.94%
	9.58% 1.25% 8.23% 8.80% 8.80% 0.57% 5.76% 2.06% 6.03% 0.47% 7.87% 1.31% 4.33% 0.39% 5.19% 0.87% 3.67% 0.36% 4.25% 0.75% 3.27% 0.33% 4.35% 0.62% 2.95% 0.31% 3.83% 0.58% 2.72% 0.29% 3.41% 0.48% 2.54% 0.28% 5.29% 0.42% 2.31% 0.27%	67.42%32.58%75.66%24.34%79.27%20.73%81.82%18.18%83.97%16.03%85.75%14.25%87.06%12.94%88.81%11.19%
No of test Flotation Copper ore Particle size Type of	9.58% 1.25% 8.23% 8.80% 8.80% 0.57% 5.76% 2.06% 6.03% 0.47% 7.87% 1.31% 4.33% 0.39% 5.19% 0.87% 3.67% 0.36% 4.25% 0.75% 3.27% 0.33% 4.35% 0.62% 2.95% 0.31% 3.83% 0.58% 2.72% 0.29% 3.41% 0.48% 2.54% 0.28% 5.29% 0.42% 2.31% 0.27% 51.82% 0.27% 1.25% 0.00%	67.42%32.58%75.66%24.34%79.27%20.73%81.82%18.18%83.97%16.03%85.75%14.25%87.06%12.94%88.81%11.19%100.00%0.00%

	machine	type		fraction	collector	collector
39	Denver	dolomite		71-100 μm	Z	100 g/Mg
Product	γ	λ	β	θ	ε	η
			0.10477	0.012155	0	1
P1	0.079786	0.09697	0.09697	0.004801	0.636508	0.363492
P2	0.04008	0.01913	0.070942	0.004149	0.699587	0.300413
P3	0.051429	0.01261	0.053429	0.003624	0.75294	0.24706
P4	0.051787	0.00806	0.042897	0.003328	0.787279	0.212721
P5	0.041905	0.00545	0.036975	0.003207	0.806068	0.193932
P6	0.029495	0.0054	0.033812	0.003115	0.819172	0.180828
P7	0.040601	0.00417	0.030221	0.003051	0.8331	0.1669
P8	0.025477	0.00431	0.02839	0.003001	0.842134	0.157866
Р9	0.031002	0.004	0.026459	0.00295	0.852336	0.147664
Т	0.608438	0.00295	0.012155	0	1	0
No of test	Flotation	Copper ore		Particle size	Type of	Dose of
	machine	type		fraction	collector	collector
40	Denver	dolomite		71-100 μm	Z	150 g/Mg
Product	γ	λ	β	θ	ε	η
			0.10091	0.012088	0	1
P1	0.083293	0.09311	0.09311	0.004727	0.641561	0.358439
P2	0.05516	0.01759	0.063023	0.003903	0.721826	0.278174
P3	0.061546	0.00988	0.046669	0.003443	0.772128	0.227872
P4	0.047246	0.00683	0.039056	0.003231	0.798822	0.201178
P5	0.038151	0.00545	0.034564	0.003112	0.816022	0.183978
P6	0.026395	0.00524	0.032081	0.003031	0.827464	0.172536
P7	0.036363	0.00418	0.029167	0.002966	0.840038	0.159962
P8	0.022363	0.004	0.027648	0.00293	0.847438	0.152562
Р9	0.020726	0.00351	0.02637	0.00291	0.853456	0.146544
Т	0.608757	0.00291	0.012088	0	1	0
No of test	Flotation	Copper ore		Particle size	Type of	Dose of
	machine	type		fraction	collector	collector
41	Denver	dolomite	2	100-125 μm	Ε	100 g/Mg
Product	γ	λ	β	9 1 050/	3	η 100.000(
Di	a a/	0.0 - 0/	8.83%	1.25%	0.00%	100.00%
P1	8.75%	8.05%	8.05%	0.60%	56.26%	43.74%
P2	6.13%	2.16%	5.62%	0.49%	66.83%	33.17%
P3	2.45%	1.44%	5.03%	0.46%	69.65%	30.35%
P4	3.89%	1.04%	4.30%	0.43%	72.88%	27.12%
P5	4.97%	0.88%	3.65%	0.40%	76.37%	23.63%
P6	1.89%	0.75%	3.46%	0.39%	77.50%	22.50%
P7	3.99%	0.69%	3.11%	0.37%	79.70%	20.30%
P8	2.80%	0.68%	2.92%	0.36%	81.22%	18.78%
P9	3.29%	0.57%	2.71%	0.35%	82.72%	17.28%
Т	61.83%	0.35%	1.25%	0.00%	100.00%	0.00%
No of test	Flotation	Copper ore		Particle size	Type of	Dose of
42	machine	type dolomite		fraction	collector E	collector
42 Product	Denver		0	100-125 μm		150 g/Mg
rroduct	γ	λ	β	9 1 21%	ع /00.00	η 100.00%
D1	0.200/	7 700/	8.48% 7.70%	1.21%	0.00%	100.00%
P1 P2	9.30%	7.70%	7.70%	0.54%	59.28%	40.72%
P2	0.60%	1.80%	7.35%	0.53%	60.16%	39.84%

P8

1.67%

0.55%

2.58%

P3	8.18%	1.39%	4.65%	0.45%	69.58%	30.42%
P4	4.65%	1.06%	3.92%	0.41%	73.66%	26.34%
P5	3.61%	0.83%	3.49%	0.39%	76.14%	23.86%
P6	3.61%	0.79%	3.17%	0.37%	78.50%	21.50%
P7	0.11%	0.75%	3.16%	0.37%	78.57%	21.43%
P8	2.68%	0.64%	2.95%	0.36%	79.99%	20.01%
Р9	3.46%	0.53%	2.72%	0.35%	81.51%	18.49%
Т	63.82%	0.35%	1.21%	0.00%	100.00%	0.00%
No of test	Flotation	Copper ore		Particle size	Type of	Dose of
	machine	type		fraction	collector	collector
43	Denver	dolomite		100-125 μm	Z	100 g/Mg
Product	γ	λ	β	θ	ε	η
			10.02%	1.20%	0.00%	100.00%
P1	8.09%	9.24%	9.24%	0.50%	62.06%	37.94%
P2	3.82%	1.97%	6.91%	0.43%	68.30%	31.70%
P3	3.52%	1.02%	5.56%	0.41%	71.29%	28.71%
P4	3.46%	0.79%	4.69%	0.39%	73.56%	26.44%
P5	2.75%	0.64%	4.18%	0.38%	75.02%	24.98%
P6	1.82%	0.52%	3.89%	0.38%	75.81%	24.19%
P7	1.73%	0.47%	3.66%	0.38%	76.48%	23.52%
P8	1.30%	0.41%	3.50%	0.38%	76.92%	23.08%
Р9	1.73%	0.30%	3.30%	0.38%	77.35%	22.65%
Т	71.79%	0.38%	1.20%	0.00%	100.00%	0.00%
No of test	Flotation	Copper ore		Particle size	Type of	Dose of
	machine	type		fraction	collector	collector
44	Denver	dolomite		100-125 μm	Z	150 g/Mg
Product	γ	λ	β	θ	ε	η
			9.29%	1.16%	0.00%	100.00%
P1	8.34%	8.51%	8.51%	0.50%	60.99%	39.01%
P2	3.73%	2.23%	6.57%	0.42%	68.12%	31.88%
P3	4.36%	1.13%	5.13%	0.39%	72.33%	27.67%
P4	3.82%	0.81%	4.31%	0.37%	74.99%	25.01%
P5	3.12%	0.60%	3.82%	0.36%	76.60%	23.40%
P6	2.11%	0.55%	3.55%	0.35%	77.60%	22.40%
P7	2.14%	0.50%	3.31%	0.35%	78.52%	21.48%
P8	1.51%	0.49%	3.16%	0.34%	79.15%	20.85%
Р9	1.22%	0.48%	3.06%	0.34%	79.66%	20.34%
Т	69.66%	0.34%	1.16%	0.00%	100.00%	0.00%
No of test	Flotation	Copper ore		Particle size	Type of	Dose of
	machine	type		fraction	collector	collector
45	Denver	dolomite		125-200 μm	Ε	100 g/Mg
Product	γ	λ	β	θ	З	η
			6.38%	1.14%	0.00%	100.00%
P1	11.47%	5.60%	5.60%	0.56%	56.26%	43.74%
P2	5.65%	1.90%	4.38%	0.47%	65.66%	34.34%
P3	4.58%	1.36%	3.74%	0.42%	71.12%	28.88%
P4	4.35%	1.00%	3.28%	0.39%	74.93%	25.07%
P5	3.48%	0.90%	3.00%	0.36%	77.67%	22.33%
P6	2.24%	0.85%	2.85%	0.35%	79.34%	20.66%
P7	2.84%	0.72%	2.68%	0.33%	81.13%	18.87%
		a a/		0.000/		

0.32%

81.93%

18.07%

Р9	1.00%	0.55%	2.52%	0.32%	82.42%	17.58%
Т	62.72%	0.32%	1.14%	0.00%	100.00%	0.00%
No of test	Flotation	Copper ore		Particle size	Type of	Dose of
	machine	type		fraction	collector	collector
46	Denver	dolomite		125-200 μm	Ε	150 g/Mg
Product	γ	λ	β	θ	ε	η
			6.28%	1.13%	0.00%	100.00%
P1	11.16%	5.50%	5.50%	0.58%	54.28%	45.72%
P2	4.82%	1.70%	4.35%	0.52%	61.54%	38.46%
P3	5.19%	1.35%	3.62%	0.46%	67.74%	32.26%
P4	3.08%	1.10%	3.30%	0.44%	70.74%	29.26%
P5	2.81%	1.08%	3.07%	0.41%	73.43%	26.57%
P6	2.04%	0.55%	2.89%	0.41%	74.42%	25.58%
P7	2.14%	0.98%	2.76%	0.39%	76.28%	23.72%
P8	2.04%	0.88%	2.64%	0.37%	77.87%	22.13%
Р9	1.61%	0.58%	2.55%	0.37%	78.69%	21.31%
Т	65.09%	0.37%	1.13%	0.00%	100.00%	0.00%
No of test	Flotation	Copper ore		Particle size	Type of	Dose of
	machine	type		fraction	collector	collector
47	Denver	dolomite		125-200 μm	Z	100 g/Mg
Product	γ	λ	β	θ	ε	η
			9.13%	1.18%	0.00%	100.00%
P1	7.63%	8.35%	8.35%	0.58%	54.14%	45.86%
P2	3.68%	2.00%	6.28%	0.53%	60.40%	39.60%
Р3	3.92%	1.17%	4.97%	0.50%	64.29%	35.71%
P4	2.71%	0.85%	4.34%	0.48%	66.24%	33.76%
P5	1.74%	0.67%	4.02%	0.48%	67.23%	32.77%
P6	0.83%	0.53%	3.88%	0.48%	67.60%	32.40%
P7	1.83%	0.55%	3.60%	0.48%	68.46%	31.54%
P8	0.84%	0.48%	3.49%	0.48%	68.80%	31.20%
Р9	0.99%	0.61%	3.37%	0.48%	69.32%	30.68%
Т	75.83%	0.48%	1.18%	0.00%	100.00%	0.00%
No of test	Flotation	Copper ore		Particle size	Type of	Dose of
NO OI test	machine	type		fraction	collector	collector
48	Denver	dolomite		125-200 μm	Z	150 g/Mg
Product	γ	λ	β	θ	ε	η
			8.27%	1.16%	0.00%	100.00%
P1	7.93%	7.49%	7.49%	0.61%	51.33%	48.67%
P2	4.52%	2.26%	5.59%	0.53%	60.17%	39.83%
P3	4.65%	1.26%	4.41%	0.49%	65.21%	34.79%
P4	2.86%	1.00%	3.92%	0.47%	67.68%	32.32%
P5	2.53%	0.89%	3.58%	0.45%	69.62%	30.38%
DC	1 200/	0.67%	3.37%	0.45%	70.65%	29.35%
P6	1.78%					
P6 P7	1.78% 1.22%	0.72%	3.24%	0.44%	71.42%	28.58%
			3.24% 3.15%	0.44% 0.44%	71.42% 72.07%	28.58% 27.93%
P7	1.22%	0.72%				

Table A3. Averaged results of flotation test of shale copper ore in Denver flotation machine (E – water solution of ethyl sodium xanthate; Z – water solution of isobutyl sodium xanthate)

No of test Flotation Copper ore Particle Type of Dose of	_	mater solution	ii of etily i bot	aram Martinate, 2	mater boracion of 1505 at	yi boalam y	(antifiate)
		No of test	Flotation	Copper ore	Particle	Type of	Dose of

	machine	type		size fraction	collector	collector
49	Denver	shale		0-20 μm	E	100 g/Mg
Product	γ	λ	β	θ	ε	η
	i		7.53%	1.76%	0.00%	100.00%
P1	17.56%	6.75%	6.75%	0.70%	67.38%	32.62%
P2	10.37%	2.18%	5.05%	0.48%	80.19%	19.81%
P3	16.19%	1.10%	3.60%	0.30%	90.28%	9.72%
P4	11.53%	0.52%	2.96%	0.25%	93.69%	6.31%
P5	11.14%	0.38%	2.53%	0.20%	96.09%	3.91%
P6	8.10%	0.26%	2.29%	0.19%	97.29%	2.71%
P7	5.31%	0.25%	2.15%	0.17%	98.03%	1.97%
P8	4.91%	0.17%	2.04%	0.17%	98.51%	1.49%
P9	2.70%	0.18%	1.98%	0.17%	98.78%	1.22%
T	12.15%	0.17%	1.76%	0.00%	99.96%	0.04%
1		0.17 /0	1	Particle	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
No of test	Flotation	Copper ore		size	Type of	Dose of
	machine	type		fraction	collector	collector
50	Denver	shale		0-20 μm	E	150 g/Mg
Product	γ	λ	β	9 20 µ in	<u>ط</u> ٤	100 β .ι.ιε η
iiouuci	Ĩ		6.23%	1.75%	0.00%	100.00%
P1	21.03%	5.45%	5.45%	0.76%	65.52%	34.48%
P2	7.57%	3.38%	4.90%	0.49%	80.15%	19.85%
P3	17.17%	1.08%	3.47%	0.30%	90.70%	9.30%
P4	13.82%	0.50%	2.78%	0.23%	94.65%	5.35%
P5	9.28%	0.37%	2.45%	0.19%	96.59%	3.41%
P6	6.73%	0.29%	2.26%	0.16%	97.70%	2.30%
P7	4.83%	0.27%	2.14%	0.14%	98.45%	1.55%
P8	4.93%	0.21%	2.03%	0.11%	99.04%	0.96%
P9	4.99% 1.20%	0.21%	2.00%	0.11%	99.16%	0.90%
T	13.42%	0.17 %	2.00 % 1.75%	0.00%	100.00%	0.04%
1	13.42 %	0.11%	1.73%	Particle	100.00 %	0.00%
No of test	Flotation	Copper ore		size	Type of	Dose of
no or lest	machine	type		fraction	collector	collector
51	Denver	shale		0-20 μm	Z	100 g/Mg
Product	γ	λ	β	ο 20 μm 9	لے ٤	100 β /14ε η
Tiouuci	Ŷ	71	6.56%	1.83%	0.00%	100.00%
P1	22.62%	5.78%	5.78%	0.67%	0.00 % 71.47%	28.53%
P2	14.43%	1.41%	4.08%	0.51%	82.57%	17.43%
P3	14.43 % 13.99%	0.69%	4.08 % 3.15%	0.31%	82.37 % 87.81%	17.43%
P4	9.45%	0.40%	2.72%	0.47%	89.85%	10.15%
P5	5.65%	0.40%	2.51%	0.49%	90.87%	9.13%
P6	6.07%	0.25%	2.31%	0.49%	91.71%	8.29%
Р6 Р7	6.07 % 5.89%	0.23%	2.32% 2.16%	0.54%	91.71% 92.34%	8.29% 7.66%
P7 P8	5.89% 4.54%	0.20% 0.17%	2.16% 2.05%	0.64% 0.76%	92.34% 92.77%	7.66%
10						
DO	3.45%	0.16%	1.98%	0.91%	93.07%	6.93%
P9 T		0.010/	1 0 0 0 /	0.000/	$\Omega \Omega \Omega \nabla \Omega'$	
Р9 Т	13.88%	0.91%	1.83%	0.00%	99.97%	0.03%
		0.91% Copper ore	1.83%	0.00% Particle size	99.97% Type of	0.03% Dose of

52	Denver	shale		0-20 μm	Z	150 g/Mg
Product	γ	λ	β	θ	ε	η
			6.75%	1.71%	0.00%	100.00%
P1	20.76%	5.97%	5.97%	0.59%	72.63%	27.37%
P2	8.23%	2.20%	4.90%	0.40%	83.25%	16.75%
P3	11.30%	0.89%	3.77%	0.31%	89.14%	10.86%
P4	10.64%	0.48%	3.08%	0.27%	92.10%	7.90%
P5	10.30%	0.31%	2.62%	0.27%	93.98%	6.02%
P6	8.05%	0.28%	2.35%	0.26%	95.30%	4.70%
P7	7.46%	0.20%	2.14%	0.28%	96.17%	3.83%
P8	3.77%	1.18%	2.09%	0.11%	98.77%	1.23%
P9	2.92%	0.13%	2.02%	0.10%	98.98%	1.02%
Т	16.57%	0.11%	1.71%	0.00%	100.00%	0.00%
				Particle		
No of test	Flotation	Copper ore		size	Type of	Dose of
	machine	type		fraction	collector	collector
53	Denver	shale		20-40 μm	Ε	100 g/Mg
Product	γ	λ	β	9	ε	η
	·		8.40%	2.70%	0.00%	100.00%
P1	29.67%	7.62%	7.62%	0.63%	83.70%	16.30%
P2	10.56%	1.91%	6.12%	0.40%	91.17%	8.83%
P3	9.49%	0.96%	5.14%	0.29%	94.55%	5.45%
P4	5.97%	0.77%	4.67%	0.23%	96.25%	3.75%
P5	5.88%	0.48%	4.27%	0.19%	97.29%	2.71%
P6	4.73%	0.37%	3.99%	0.16%	97.94%	2.06%
P7	3.88%	0.31%	3.79%	0.15%	98.39%	1.61%
P8	3.79%	0.26%	3.61%	0.13%	98.75%	1.25%
P9	3.51%	0.19%	3.45%	0.12%	99.00%	1.00%
T	22.53%	0.12%	2.70%	0.00%	100.00%	0.00%
				Particle		
No of test	Flotation	Copper ore		size	Type of	Dose of
	machine	type		fraction	collector	collector
54	Denver	shale		20-40 μm	Е	150 g/Mg
Product	γ	λ	β	9	ε	η η
			8.25%	2.86%	0.00%	100.00%
P1	32.23%	7.47%	7.47%	0.67%	84.19%	15.81%
P2	9.92%	1.99%	6.18%	0.44%	91.09%	8.91%
P3	9.01%	0.99%	5.27%	0.34%	94.21%	5.79%
P4	7.07%	0.79%	4.72%	0.26%	96.16%	3.84%
P5	4.84%	0.51%	4.40%	0.23%	97.02%	2.98%
P6	3.87%	0.44%	4.17%	0.21%	97.62%	2.38%
P7	4.05%	0.39%	3.96%	0.18%	98.17%	1.83%
P8	3.73%	0.33%	3.77%	0.16%	98.60%	1.40%
P9	3.43%	0.21%	3.62%	0.15%	98.85%	1.15%
T	21.85%	0.15%	2.86%	0.00%	100.00%	0.00%
1		0.1070	2.0070	Particle		
No of test	Flotation	Copper ore		size	Type of	Dose of
- 10 01 1001	machine	type		fraction	collector	collector
55	Denver	shale		20-40 μm	Z	100 g/Mg
Product	γ	λ	β	20 10 µm 9	<u>ــــــــــــــــــــــــــــــــــــ</u>	η
i iouuci	r	<i>/</i> (P	v	C	.1

			9.08%	2.70%	0.00%	100.00%
P1	28.04%	8.30%	8.30%	0.51%	86.35%	13.65%
P2	10.96%	1.55%	6.40%	0.32%	92.65%	7.35%
Р3	8.38%	0.83%	5.42%	0.24%	95.23%	4.77%
P4	2.98%	0.76%	5.14%	0.21%	96.07%	3.93%
P5	1.55%	0.71%	5.01%	0.20%	96.48%	3.52%
P6	2.40%	0.56%	4.81%	0.18%	96.98%	3.02%
P7	1.15%	0.54%	4.72%	0.17%	97.21%	2.79%
P8	1.69%	0.41%	4.60%	0.16%	97.46%	2.54%
P9	2.48%	0.32%	4.42%	0.15%	97.75%	2.25%
T	40.38%	0.32 %	4.42 % 2.70%	0.13%	100.00%	0.00%
1	40.30 %	0.15%	2.70%	Particle	100.00 %	0.00 /0
No of test	Flotation	Copper ore		size	Type of	Dose of
no or test	machine	type		fraction	collector	collector
56	Denver	shale		20-40 µm	Z	150 g/Mg
Product		λ	β	20-40 μm θ		
riouuci	γ	Λ	р 9.01%		3 /900 0	η 100.00%
D1	20.010/	0.000/		2.76%	0.00%	100.00%
P1	29.01%	8.23%	8.23%	0.53%	86.40%	13.60%
P2	8.91%	1.81%	6.72%	0.35%	92.25%	7.75%
P3	10.53%	0.81%	5.44%	0.25%	95.34%	4.66%
P4	5.24%	0.56%	4.96%	0.21%	96.40%	3.60%
P5	4.60%	0.44%	4.60%	0.19%	97.14%	2.86%
P6	2.75%	0.37%	4.41%	0.18%	97.50%	2.50%
P7	2.65%	0.27%	4.24%	0.17%	97.76%	2.24%
P8	0.83%	0.39%	4.19%	0.17%	97.88%	2.12%
P9	2.71%	0.23%	4.03%	0.16%	98.10%	1.90%
Т	32.76%	0.16%	2.76%	0.00%	100.00%	0.00%
	Flotation	Copper ore		Particle	Type of	Dose of
No of test	machine	type		size	collector	collector
				fraction	concetor	
57	Denver	shale		40-71 μm	Ε	100 g/Mg
Product	γ	λ	β	θ	ε	η
			7.49%	2.73%	0.00%	100.00%
P1	35.03%	6.71%	6.71%	0.59%	86.08%	13.92%
P2	9.01%	1.58%	5.66%	0.42%	91.29%	8.71%
P3	9.17%	0.87%	4.83%	0.34%	94.22%	5.78%
P4	4.97%	0.62%	4.47%	0.30%	95.35%	4.65%
P5	4.31%	0.53%	4.20%	0.28%	96.19%	3.81%
P6	3.51%	0.50%	4.01%	0.25%	96.83%	3.17%
P7	3.68%	0.46%	3.82%	0.23%	97.45%	2.55%
P8	3.32%	0.37%	3.66%	0.21%	97.90%	2.10%
P9	2.24%	0.35%	3.56%	0.20%	98.19%	1.81%
T	24.75%	0.20%	2.73%	0.00%	100.00%	0.00%
-				Particle		
No of test	Flotation	Copper ore		size	Type of	Dose of
	machine	type		fraction	collector	collector
58	D	shale		40-71 μm	Е	150 g/Mg
~ ~ ~	Denver					
	Denver		ß	•		
Product	Denver γ	λ	β 7 59%	θ.	ε	η
			β 7.59% 6.81%	•		

P2	9.79%	1.72%	5.74%	0.49%	91.08%	8.92%
P3	10.10%	0.99%	4.89%	0.37%	94.49%	5.51%
P4	5.53%	0.68%	4.51%	0.33%	95.77%	4.23%
P5	4.89%	0.64%	4.23%	0.28%	96.84%	3.16%
P6	3.85%	0.48%	4.03%	0.25%	97.47%	2.53%
P7	4.54%	0.36%	3.81%	0.23%	98.04%	1.96%
P8	3.81%	0.32%	3.64%	0.22%	98.45%	1.55%
Р9	2.59%	0.23%	3.53%	0.22%	98.66%	1.34%
Т	18.27%	0.22%	2.92%	0.00%	100.00%	0.00%
		2		Particle	- 1	
No of test	Flotation	Copper ore		size	Type of	Dose of
	machine	type		fraction	collector	collector
59	Denver	shale		40-71 μm	Z	100 g/Mg
Product	γ	λ	β	θ	ε	η
			7.07%	2.60%	0.00%	100.00%
P1	34.88%	6.29%	6.29%	0.62%	84.47%	15.53%
P2	9.49%	1.66%	5.30%	0.44%	90.54%	9.46%
P3	5.49%	1.18%	4.85%	0.36%	93.02%	6.98%
P4	2.89%	0.90%	4.63%	0.33%	94.02%	5.98%
P5	2.66%	0.75%	4.45%	0.30%	94.78%	5.22%
P6	1.30%	0.67%	4.36%	0.29%	95.12%	4.88%
P7	1.17%	0.55%	4.28%	0.29%	95.37%	4.63%
P8	1.23%	0.50%	4.20%	0.28%	95.61%	4.39%
Р9	1.02%	0.49%	4.14%	0.27%	95.80%	4.20%
Т	39.86%	0.27%	2.60%		100.00%	0.00%
Т	39.86%	0.27%	2.60%	0.00% Particle	100.00%	0.00%
T No of test	Flotation	Copper ore	2.60%	0.00%	Type of	Dose of
			2.60%	0.00% Particle		
	Flotation	Copper ore	2.60%	0.00% Particle size	Type of	Dose of
No of test	Flotation machine	Copper ore type	2.60%	0.00% Particle size fraction	Type of collector	Dose of collector
No of test 60	Flotation machine Denver	Copper ore type shale		0.00% Particle size fraction 40-71 μm	Type of collector Z	Dose of collector 150 g/Mg
No of test 60	Flotation machine Denver	Copper ore type shale	β	0.00% Particle size fraction 40-71 μm §	Type of collector Ζ ε	Dose of collector 150 g/Mg η
No of test 60 Product	Flotation machine Denver γ	Copper ore type shale λ	β 7.36%	0.00% Particle size fraction 40-71 μm	Type of collector Ζ ε 0.00%	Dose of collector 150 g/Mg η 100.00%
No of test 60 Product P1	Flotation machine Denver γ 37.00%	Copper ore type shale λ 6.58%	β 7.36% 6.58%	0.00% Particle size fraction 40-71 μm θ 2.80% 0.58%	Type of collector Z ε 0.00% 87.01%	Dose of collector 150 g/Mg η 100.00% 12.99%
No of test 60 Product P1 P2	Flotation machine Denver γ 37.00% 8.67%	Copper ore type shale λ 6.58% 1.57%	β 7.36% 6.58% 5.63%	0.00% Particle size fraction 40-71 μm 2.80% 0.58% 0.42%	Type of collector Ζ ε 0.00% 87.01% 91.87%	Dose of collector 150 g/Mg η 100.00% 12.99% 8.13%
No of test 60 Product P1 P2 P3	Flotation machine Denver γ 37.00% 8.67% 6.37%	Copper ore type shale λ 6.58% 1.57% 0.99%	β 7.36% 6.58% 5.63% 5.06%	0.00% Particle size fraction 40-71 μm	Type of collector Z ε 0.00% 87.01% 91.87% 94.12%	Dose of collector 150 g/Mg η 100.00% 12.99% 8.13% 5.88%
No of test 60 Product P1 P2 P3 P4	Flotation machine Denver γ 37.00% 8.67% 6.37% 3.08%	Copper ore type shale λ 6.58% 1.57% 0.99% 0.76%	β 7.36% 6.58% 5.63% 5.06% 4.82%	0.00% Particle size fraction 40-71 μm 2.80% 0.58% 0.42% 0.34% 0.31%	Type of collector Ζ ε 0.00% 87.01% 91.87% 94.12% 94.96%	Dose of collector 150 g/Mg η 100.00% 12.99% 8.13% 5.88% 5.04%
No of test 60 Product P1 P2 P3 P4 P5	Flotation machine Denver γ 37.00% 8.67% 6.37% 3.08% 3.08% 3.02%	Copper ore type shale λ 6.58% 1.57% 0.99% 0.76% 0.53%	β 7.36% 6.58% 5.63% 5.06% 4.82% 4.60%	0.00% Particle size fraction 40-71 μm 9 2.80% 0.58% 0.42% 0.34% 0.31% 0.30%	Type of collector Z ε 0.00% 87.01% 91.87% 94.12% 94.96% 95.53%	Dose of collector 150 g/Mg η 100.00% 12.99% 8.13% 5.88% 5.04% 4.47%
No of test 60 Product P1 P2 P3 P4 P5 P6	Flotation machine Denver γ 37.00% 8.67% 6.37% 3.08% 3.02% 1.46%	Copper ore type shale λ 6.58% 1.57% 0.99% 0.76% 0.53% 0.56%	β 7.36% 6.58% 5.63% 5.06% 4.82% 4.60% 4.50%	0.00% Particle size fraction 40-71 μm	Type of collector Z ε 0.00% 87.01% 91.87% 94.12% 94.96% 95.53% 95.82%	Dose of collector 150 g/Mg η 100.00% 12.99% 8.13% 5.88% 5.04% 4.47% 4.18%
No of test 60 Product P1 P2 P3 P4 P5 P6 P7	Flotation machine Denver γ 37.00% 8.67% 6.37% 3.08% 3.02% 1.46% 1.34%	Copper ore type shale λ 6.58% 1.57% 0.99% 0.76% 0.53% 0.56% 0.54%	β 7.36% 6.58% 5.63% 5.06% 4.82% 4.60% 4.50% 4.41%	0.00% Particle size fraction 40-71 μm 2.80% 0.58% 0.42% 0.34% 0.31% 0.31% 0.30% 0.29% 0.28%	Type of collector Ζ ε 0.00% 87.01% 91.87% 94.12% 94.96% 95.53% 95.82% 96.07%	Dose of collector 150 g/Mg η 100.00% 12.99% 8.13% 5.88% 5.04% 4.47% 4.18% 3.93%
No of test 60 Product P1 P2 P3 P4 P5 P6 P7 P8	Flotation machine Denver γ 37.00% 8.67% 6.37% 3.08% 3.02% 1.46% 1.34% 1.10%	$\begin{array}{c} {\rm Copper \ ore} \\ {\rm type} \\ {\rm shale} \\ \lambda \\ 6.58\% \\ 1.57\% \\ 0.99\% \\ 0.76\% \\ 0.53\% \\ 0.56\% \\ 0.54\% \\ 0.48\% \end{array}$	eta 7.36% 6.58% 5.63% 5.06% 4.82% 4.60% 4.60% 4.50% 4.41% 4.34%	0.00% Particle size fraction 40-71 μm 9 2.80% 0.58% 0.42% 0.34% 0.34% 0.31% 0.30% 0.29% 0.28%	Type of collector Z ε 0.00% 87.01% 91.87% 94.12% 94.96% 95.53% 95.82% 96.07% 96.26%	Dose of collector 150 g/Mg η 100.00% 12.99% 8.13% 5.88% 5.04% 4.47% 4.18% 3.93% 3.74%
No of test 60 Product P1 P2 P3 P4 P5 P6 P7 P8 P9	Flotation machine Denver γ 37.00% 8.67% 6.37% 3.08% 3.02% 1.46% 1.34% 1.10% 1.48% 36.48%	$\begin{array}{c} {\rm Copper \ ore} \\ {\rm type} \\ {\rm shale} \\ \lambda \\ 6.58\% \\ 1.57\% \\ 0.99\% \\ 0.76\% \\ 0.99\% \\ 0.76\% \\ 0.53\% \\ 0.56\% \\ 0.54\% \\ 0.48\% \\ 0.41\% \\ 0.27\% \end{array}$	β 7.36% 6.58% 5.63% 5.06% 4.82% 4.60% 4.50% 4.41% 4.34% 4.25%	0.00% Particle size fraction 40-71 μm	Type of collector Z ε 0.00% 87.01% 91.87% 94.12% 94.96% 95.53% 95.82% 96.07% 96.26% 96.48% 100.00%	Dose of collector 150 g/Mg η 100.00% 12.99% 8.13% 5.88% 5.04% 4.47% 4.18% 3.93% 3.74% 3.52% 0.00%
No of test 60 Product P1 P2 P3 P4 P5 P6 P7 P8 P9 T	Flotation machine Denver γ 37.00% 8.67% 6.37% 3.08% 3.02% 1.46% 1.34% 1.10% 1.48% 36.48%	Copper ore type shale λ 6.58% 1.57% 0.99% 0.76% 0.53% 0.56% 0.54% 0.41% 0.27% Copper ore	β 7.36% 6.58% 5.63% 5.06% 4.82% 4.60% 4.50% 4.41% 4.34% 4.25%	0.00% Particle size fraction 40-71 μm 9 2.80% 0.58% 0.42% 0.34% 0.31% 0.28% 0.28% 0.28% 0.27% 0.00%	Type of collector Z ε 0.00% 87.01% 91.87% 94.12% 94.96% 95.53% 95.82% 96.07% 96.26% 96.48% 100.00%	Dose of collector 150 g/Mg η 100.00% 12.99% 8.13% 5.88% 5.04% 4.47% 4.18% 3.93% 3.74% 3.52% 0.00% Dose of
No of test 60 Product P1 P2 P3 P4 P5 P6 P7 P8 P9 T	Flotation machine Denver γ 37.00% 8.67% 6.37% 3.08% 3.02% 1.46% 1.34% 1.10% 1.48% 36.48%	$\begin{array}{c} {\rm Copper \ ore} \\ {\rm type} \\ {\rm shale} \\ \lambda \\ 6.58\% \\ 1.57\% \\ 0.99\% \\ 0.76\% \\ 0.99\% \\ 0.76\% \\ 0.53\% \\ 0.56\% \\ 0.54\% \\ 0.48\% \\ 0.41\% \\ 0.27\% \end{array}$	β 7.36% 6.58% 5.63% 5.06% 4.82% 4.60% 4.50% 4.41% 4.34% 4.25%	0.00% Particle size fraction 40-71 μm 9 2.80% 0.58% 0.42% 0.34% 0.31% 0.29% 0.28% 0.28% 0.27% 0.00% Particle	Type of collector Z ε 0.00% 87.01% 91.87% 94.12% 94.96% 95.53% 95.82% 96.07% 96.26% 96.48% 100.00%	Dose of collector 150 g/Mg η 100.00% 12.99% 8.13% 5.88% 5.04% 4.47% 4.18% 3.93% 3.74% 3.52% 0.00% Dose of
No of test 60 Product P1 P2 P3 P4 P5 P6 P7 P8 P9 T	Flotation machine Denver γ 37.00% 8.67% 6.37% 3.08% 3.02% 1.46% 1.34% 1.10% 1.48% 36.48%	Copper ore type shale λ 6.58% 1.57% 0.99% 0.76% 0.53% 0.56% 0.54% 0.41% 0.27% Copper ore	β 7.36% 6.58% 5.63% 5.06% 4.82% 4.60% 4.50% 4.41% 4.34% 4.25%	0.00% Particle size fraction 40-71 μm ϑ 2.80% 0.58% 0.42% 0.34% 0.31% 0.30% 0.29% 0.28% 0.28% 0.27% 0.00%	Type of collector Z ε 0.00% 87.01% 91.87% 94.12% 94.96% 95.53% 95.82% 96.07% 96.26% 96.48% 100.00%	Dose of collector 150 g/Mg η 100.00% 12.99% 8.13% 5.88% 5.04% 4.47% 4.18% 3.93% 3.74% 3.52% 0.00% Dose of collector
No of test 60 Product P1 P2 P3 P4 P5 P6 P7 P8 P9 T No of test	Flotation machine Denver γ 37.00% 8.67% 6.37% 3.08% 3.02% 1.46% 1.34% 1.10% 1.48% 36.48% Flotation machine	Copper ore type shale λ 6.58% 1.57% 0.99% 0.76% 0.53% 0.56% 0.54% 0.41% 0.27% Copper ore type	β 7.36% 6.58% 5.63% 5.06% 4.82% 4.60% 4.50% 4.41% 4.34% 4.25%	0.00% Particle size fraction 40-71 μm 9 2.80% 0.58% 0.42% 0.34% 0.31% 0.30% 0.28% 0.28% 0.27% 0.00% Particle size fraction	Type of collector Z ε 0.00% 87.01% 91.87% 94.12% 94.96% 95.53% 95.82% 96.07% 96.26% 96.48% 100.00% Type of collector	Dose of collector 150 g/Mg η 100.00% 12.99% 8.13% 5.88% 5.04% 4.47% 4.18% 3.93% 3.74% 3.52% 0.00% Dose of collector
No of test 60 Product P1 P2 P3 P4 P5 P6 P7 P8 P9 T No of test 61	Flotation machine Denver γ 37.00% 8.67% 6.37% 3.08% 3.02% 1.46% 1.34% 1.10% 1.48% 36.48% Flotation machine Denver	Copper ore type shale λ 6.58% 1.57% 0.99% 0.76% 0.53% 0.56% 0.54% 0.48% 0.41% 0.27% Copper ore type shale	β 7.36% 6.58% 5.63% 5.06% 4.82% 4.60% 4.50% 4.41% 4.34% 4.25% 2.80%	0.00% Particle size fraction 40-71 μm	Type of collector Z ε 0.00% 87.01% 91.87% 94.12% 94.96% 95.53% 95.82% 96.07% 96.26% 96.48% 100.00% Type of collector E	Dose of collector 150 g/Mg η 100.00% 12.99% 8.13% 5.88% 5.04% 4.47% 4.18% 3.93% 3.74% 3.52% 0.00% Dose of collector 100 g/Mg
No of test 60 Product P1 P2 P3 P4 P5 P6 P7 P8 P9 T No of test 61	Flotation machine Denver γ 37.00% 8.67% 6.37% 3.08% 3.02% 1.46% 1.34% 1.10% 1.48% 36.48% Flotation machine Denver	Copper ore type shale λ 6.58% 1.57% 0.99% 0.76% 0.53% 0.56% 0.54% 0.48% 0.41% 0.27% Copper ore type shale	β 7.36% 6.58% 5.63% 5.06% 4.82% 4.60% 4.50% 4.41% 4.34% 4.25% 2.80%	0.00% Particle size fraction 40-71 μm ϑ 2.80% 0.58% 0.42% 0.34% 0.31% 0.30% 0.29% 0.28% 0.28% 0.28% 0.27% 0.00% Particle size fraction 71-100 μm ϑ	Type of collector Z ε 0.00% 87.01% 91.87% 94.12% 94.96% 95.53% 95.82% 96.07% 96.26% 96.48% 100.00% Type of collector E ε	Dose of collector 150 g/Mg η 100.00% 12.99% 8.13% 5.88% 5.04% 4.47% 4.18% 3.93% 3.74% 3.52% 0.00% Dose of collector 100 g/Mg η
No of test 60 Product P1 P2 P3 P4 P5 P6 P7 P8 P9 T No of test 61 Product	Flotation machine Denver γ 37.00% 8.67% 6.37% 3.08% 3.02% 1.46% 1.34% 1.10% 1.48% 36.48% Flotation machine Denver γ	$\begin{tabular}{lllllllllllllllllllllllllllllllllll$	β 7.36% 6.58% 5.63% 5.06% 4.82% 4.60% 4.50% 4.41% 4.34% 4.25% 2.80% β 6.73%	0.00% Particle size fraction 40-71 μm 9 2.80% 0.58% 0.42% 0.34% 0.31% 0.29% 0.28% 0.28% 0.27% 0.00% Particle size fraction 71-100 μm 9 2.50%	Type of collector Z ε 0.00% 87.01% 91.87% 94.12% 94.96% 95.53% 95.82% 96.07% 96.26% 96.48% 100.00% Type of collector E ε 0.00%	Dose of collector 150 g/Mg η 100.00% 12.99% 8.13% 5.88% 5.04% 4.47% 4.18% 3.93% 3.74% 3.52% 0.00% Dose of collector 100 g/Mg η 100.00%

D4						
P4	7.74%	0.73%	3.76%	0.39%	94.08%	5.92%
P5	4.34%	0.68%	3.56%	0.36%	95.26%	4.74%
P6	3.41%	0.53%	3.42%	0.34%	95.98%	4.02%
P7	4.34%	0.43%	3.24%	0.32%	96.73%	3.27%
P8	2.37%	0.37%	3.15%	0.31%	97.08%	2.92%
Р9	0.94%	0.42%	3.12%	0.31%	97.24%	2.76%
Т	22.22%	0.31%	2.50%	0.00%	100.00%	0.00%
	Flotation	Connor oro		Particle	Type of	Dose of
No of test	machine	Copper ore type		size	collector	collector
	machine	type		fraction	conector	conector
62	Denver	shale		71-100 μm	Ε	150 g/Mg
Product	γ	λ	β	θ	ε	η
			6.63%	2.60%	0.00%	100.00%
P1	36.88%	5.85%	5.85%	0.70%	82.99%	17.01%
P2	13.10%	1.36%	4.67%	0.53%	89.84%	10.16%
P3	11.38%	0.93%	3.98%	0.41%	93.92%	6.08%
P4	3.39%	0.81%	3.81%	0.37%	94.97%	5.03%
P5	3.95%	0.56%	3.63%	0.35%	95.82%	4.18%
P6	3.17%	0.47%	3.49%	0.33%	96.40%	3.60%
P7	2.88%	0.36%	3.37%	0.33%	96.79%	3.21%
P8	0.67%	0.65%	3.34%	0.32%	96.96%	3.04%
P9	0.33%	0.41%	3.33%	0.32%	97.01%	2.99%
Т	24.26%	0.32%	2.60%	0.00%	100.00%	0.00%
	Flotation	Copper ore		Particle	Type of	Dose of
No of test	machine	type		size	collector	collector
				fraction		
63	Denver	shale		71-100 μm	Z	100 g/Mg
Product	γ	λ	β	θ	8	η
			7.76%	2.61%	0.00%	100.00%
P1	29.10%	6.98%	6.98%	0.82%	77.78%	22.22%
P2	10.40%	1.78%	5.61%		0.1.070/	
7.0	10.40 /0	1.70/0	5.01 /0	0.65%	84.87%	15.13%
P3	7.39%	1.66%	4.99%	0.51%	89.56%	10.44%
P4	7.39% 3.97%	1.66% 0.96%	4.99% 4.67%	0.51% 0.48%	89.56% 91.02%	10.44% 8.98%
P4 P5	7.39% 3.97% 2.30%	1.66% 0.96% 0.75%	4.99% 4.67% 4.50%	0.51% 0.48% 0.46%	89.56% 91.02% 91.68%	10.44% 8.98% 8.32%
P4 P5 P6	7.39% 3.97% 2.30% 1.52%	1.66% 0.96% 0.75% 0.67%	4.99% 4.67% 4.50% 4.40%	0.51% 0.48% 0.46% 0.46%	89.56% 91.02% 91.68% 92.07%	10.44% 8.98% 8.32% 7.93%
P4 P5 P6 P7	7.39% 3.97% 2.30% 1.52% 1.51%	1.66% 0.96% 0.75% 0.67% 0.59%	4.99% 4.67% 4.50% 4.40% 4.29%	0.51% 0.48% 0.46% 0.46% 0.45%	89.56% 91.02% 91.68% 92.07% 92.41%	10.44% 8.98% 8.32% 7.93% 7.59%
P4 P5 P6 P7 P8	7.39% 3.97% 2.30% 1.52%	1.66% 0.96% 0.75% 0.67%	4.99% 4.67% 4.50% 4.40%	0.51% 0.48% 0.46% 0.46%	89.56% 91.02% 91.68% 92.07% 92.41% 92.62%	10.44% 8.98% 8.32% 7.93% 7.59% 7.38%
P4 P5 P6 P7 P8 P9	7.39% 3.97% 2.30% 1.52% 1.51%	1.66% 0.96% 0.75% 0.67% 0.59%	4.99% 4.67% 4.50% 4.40% 4.29%	0.51% 0.48% 0.46% 0.46% 0.45%	89.56% 91.02% 91.68% 92.07% 92.41%	10.44% 8.98% 8.32% 7.93% 7.59%
P4 P5 P6 P7 P8	7.39% 3.97% 2.30% 1.52% 1.51% 1.00%	1.66% 0.96% 0.75% 0.67% 0.59% 0.55%	4.99% 4.67% 4.50% 4.40% 4.29% 4.23%	0.51% 0.48% 0.46% 0.46% 0.45% 0.45% 0.45% 0.45% 0.00%	89.56% 91.02% 91.68% 92.07% 92.41% 92.62%	10.44% 8.98% 8.32% 7.93% 7.59% 7.38%
P4 P5 P6 P7 P8 P9 T	7.39% 3.97% 2.30% 1.52% 1.51% 1.00% 0.32% 42.48%	1.66% 0.96% 0.75% 0.67% 0.59% 0.55% 0.49% 0.45%	4.99% 4.67% 4.50% 4.40% 4.29% 4.23% 4.23%	0.51% 0.48% 0.46% 0.46% 0.45% 0.45% 0.45% 0.00% Particle	89.56% 91.02% 91.68% 92.07% 92.41% 92.62% 92.68% 100.00%	10.44% 8.98% 8.32% 7.93% 7.59% 7.38% 7.38% 7.32% 0.00%
P4 P5 P6 P7 P8 P9	7.39% 3.97% 2.30% 1.52% 1.51% 1.00% 0.32% 42.48% Flotation	1.66% 0.96% 0.75% 0.67% 0.59% 0.55% 0.49% 0.45% Copper ore	4.99% 4.67% 4.50% 4.40% 4.29% 4.23% 4.23%	0.51% 0.48% 0.46% 0.45% 0.45% 0.45% 0.45% 0.00% Particle size	89.56% 91.02% 91.68% 92.07% 92.41% 92.62% 92.68% 100.00% Type of	10.44% 8.98% 8.32% 7.93% 7.59% 7.38% 7.32% 0.00% Dose of
P4 P5 P6 P7 P8 P9 T No of test	7.39% 3.97% 2.30% 1.52% 1.51% 1.00% 0.32% 42.48% Flotation machine	1.66% 0.96% 0.75% 0.67% 0.59% 0.55% 0.49% 0.45% Copper ore type	4.99% 4.67% 4.50% 4.40% 4.29% 4.23% 4.23%	0.51% 0.48% 0.46% 0.45% 0.45% 0.45% 0.45% 0.00% Particle size fraction	89.56% 91.02% 91.68% 92.07% 92.41% 92.62% 92.68% 100.00% Type of collector	10.44% 8.98% 8.32% 7.93% 7.59% 7.38% 7.32% 0.00% Dose of collector
P4 P5 P6 P7 P8 P9 T No of test	7.39% 3.97% 2.30% 1.52% 1.51% 1.00% 0.32% 42.48% Flotation	1.66% 0.96% 0.75% 0.67% 0.59% 0.55% 0.49% 0.45% Copper ore type shale	4.99% 4.67% 4.50% 4.40% 4.29% 4.23% 4.23% 4.21% 2.61%	0.51% 0.48% 0.46% 0.45% 0.45% 0.45% 0.45% 0.00% Particle size fraction 71-100 μm	89.56% 91.02% 91.68% 92.07% 92.41% 92.62% 92.68% 100.00% Type of	10.44% 8.98% 8.32% 7.93% 7.59% 7.38% 7.32% 0.00% Dose of collector
P4 P5 P6 P7 P8 P9 T No of test	7.39% 3.97% 2.30% 1.52% 1.51% 1.00% 0.32% 42.48% Flotation machine	1.66% 0.96% 0.75% 0.67% 0.59% 0.55% 0.49% 0.45% Copper ore type	 4.99% 4.67% 4.50% 4.40% 4.29% 4.23% 4.21% 2.61% 	0.51% 0.48% 0.46% 0.45% 0.45% 0.45% 0.00% Particle size fraction 71-100 μm §	89.56% 91.02% 91.68% 92.07% 92.41% 92.62% 92.68% 100.00% Type of collector Z ε	10.44% 8.98% 8.32% 7.93% 7.59% 7.38% 7.32% 0.00% Dose of collector 150 g/Mg η
P4 P5 P6 P7 P8 P9 T No of test 64 Product	7.39% 3.97% 2.30% 1.52% 1.51% 1.00% 0.32% 42.48% Flotation machine Denver γ	$\begin{array}{c} 1.66\% \\ 0.96\% \\ 0.75\% \\ 0.67\% \\ 0.59\% \\ 0.55\% \\ 0.49\% \\ 0.45\% \end{array}$ Copper ore type shale λ	 4.99% 4.67% 4.50% 4.40% 4.29% 4.23% 4.21% 2.61% 	0.51% 0.48% 0.46% 0.45% 0.45% 0.45% 0.45% 0.00% Particle size fraction 71-100 μm § 2.65%	89.56% 91.02% 91.68% 92.07% 92.41% 92.62% 92.68% 100.00% Type of collector Z ε 0.00%	10.44% 8.98% 8.32% 7.93% 7.59% 7.38% 7.32% 0.00% Dose of collector 150 g/Mg η 100.00%
P4 P5 P6 P7 P8 P9 T No of test 64 Product P1	7.39% 3.97% 2.30% 1.52% 1.51% 1.00% 0.32% 42.48% Flotation machine Denver γ 29.63%	$\begin{array}{c} 1.66\% \\ 0.96\% \\ 0.75\% \\ 0.67\% \\ 0.59\% \\ 0.55\% \\ 0.49\% \\ 0.45\% \end{array}$ $\begin{array}{c} \textbf{Copper ore} \\ \textbf{type} \\ \textbf{shale} \\ \lambda \\ \hline 7.00\% \end{array}$	4.99% 4.67% 4.50% 4.29% 4.23% 4.23% 4.21% 2.61% β 7.78% 7.00%	0.51% 0.48% 0.46% 0.45% 0.45% 0.45% 0.45% 0.00% Particle size fraction 71-100 μm § 2.65% 0.82%	89.56% 91.02% 91.68% 92.07% 92.41% 92.62% 92.68% 100.00% Type of collector Z ε 0.00% 78.22%	10.44% 8.98% 8.32% 7.93% 7.59% 7.38% 7.32% 0.00% Dose of collector 150 g/Mg η 100.00% 21.78%
P4 P5 P6 P7 P8 P9 T No of test 64 Product P1 P2	7.39% 3.97% 2.30% 1.52% 1.51% 1.00% 0.32% 42.48% Flotation machine Denver γ 29.63% 10.76%	$\begin{array}{c} 1.66\% \\ 0.96\% \\ 0.75\% \\ 0.67\% \\ 0.59\% \\ 0.55\% \\ 0.49\% \\ 0.45\% \end{array}$ Copper ore type shale λ 7.00% 1.80%	 4.99% 4.67% 4.50% 4.40% 4.29% 4.23% 4.21% 2.61% 	0.51% 0.48% 0.46% 0.45% 0.45% 0.45% 0.00% Particle size fraction 71-100 μm § 2.65% 0.82% 0.64%	89.56% 91.02% 91.68% 92.07% 92.41% 92.62% 92.68% 100.00% Type of collector Z ε 0.00% 78.22% 85.52%	10.44% 8.98% 8.32% 7.93% 7.59% 7.38% 7.32% 0.00% Dose of collector 150 g/Mg η 100.00% 21.78% 14.48%
P4 P5 P6 P7 P8 P9 T No of test 64 Product P1	7.39% 3.97% 2.30% 1.52% 1.51% 1.00% 0.32% 42.48% Flotation machine Denver γ 29.63%	$\begin{array}{c} 1.66\% \\ 0.96\% \\ 0.75\% \\ 0.67\% \\ 0.59\% \\ 0.55\% \\ 0.49\% \\ 0.45\% \end{array}$ $\begin{array}{c} \textbf{Copper ore} \\ \textbf{type} \\ \textbf{shale} \\ \lambda \\ \hline 7.00\% \end{array}$	4.99% 4.67% 4.50% 4.29% 4.23% 4.23% 4.21% 2.61% β 7.78% 7.00%	0.51% 0.48% 0.46% 0.45% 0.45% 0.45% 0.45% 0.00% Particle size fraction 71-100 μm § 2.65% 0.82%	89.56% 91.02% 91.68% 92.07% 92.41% 92.62% 92.68% 100.00% Type of collector Z ε 0.00% 78.22%	10.44% 8.98% 8.32% 7.93% 7.59% 7.38% 7.32% 0.00% Dose of collector 150 g/Mg η 100.00% 21.78%
P4 P5 P6 P7 P8 P9 T No of test 64 Product P1 P2	7.39% 3.97% 2.30% 1.52% 1.51% 1.00% 0.32% 42.48% Flotation machine Denver γ 29.63% 10.76%	$\begin{array}{c} 1.66\% \\ 0.96\% \\ 0.75\% \\ 0.67\% \\ 0.59\% \\ 0.55\% \\ 0.49\% \\ 0.45\% \end{array}$ Copper ore type shale λ 7.00% 1.80%	4.99% 4.67% 4.50% 4.40% 4.29% 4.23% 4.21% 2.61% β 7.78% 7.00% 5.61%	0.51% 0.48% 0.46% 0.45% 0.45% 0.45% 0.00% Particle size fraction 71-100 μm § 2.65% 0.82% 0.64%	89.56% 91.02% 91.68% 92.07% 92.41% 92.62% 92.68% 100.00% Type of collector Z ε 0.00% 78.22% 85.52%	10.44% 8.98% 8.32% 7.93% 7.59% 7.38% 7.32% 0.00% Dose of collector 150 g/Mg η 100.00% 21.78% 14.48%

P6	1.49%	0.67%	4.35%	0.41%	93.33%	6.67%
P7	1.78%	0.65%	4.24%	0.40%	93.77%	6.23%
P8	1.08%	0.65%	4.18%	0.39%	94.03%	5.97%
Р9	0.16%	0.61%	4.17%	0.39%	94.07%	5.93%
Т	40.13%	0.39%	2.65%	0.00%	100.00%	0.00%
	Flatetian	C		Particle	T	D
No of test	Flotation	Copper ore		size	Type of	Dose of
	machine	type		fraction	collector	collector
65	Denver	shale		100-125 μm	Ε	100 g/Mg
Product	γ	λ	β	θ	8	η
			6.88%	2.53%	0.00%	100.00%
P1	32.41%	6.10%	6.10%	0.82%	78.16%	21.84%
P2	11.92%	1.90%	4.97%	0.59%	87.11%	12.89%
P3	9.92%	1.08%	4.26%	0.48%	91.35%	8.65%
P4	4.22%	0.92%	4.02%	0.43%	92.88%	7.12%
P5	2.66%	0.64%	3.87%	0.42%	93.55%	6.45%
P6	2.06%	0.61%	3.76%	0.41%	94.05%	5.95%
P7	2.23%	0.49%	3.65%	0.40%	94.48%	5.52%
P8	0.83%	0.50%	3.61%	0.40%	94.65%	5.35%
P9	0.42%	0.51%	3.59%	0.40%	94.73%	5.27%
T	33.32%	0.40%	2.53%	0.00%	100.00%	0.00%
1		0.1070	2.0070	Particle		
No of test	Flotation	Copper ore		size	Type of	Dose of
	machine	type		fraction	collector	collector
66	Denver	shale		100-125 μm	Е	150 g/Mg
Product	γ	λ	β	9	<u>ــ</u> ٤	β η
	1		6.98%	2.55%	0.00%	100.00%
P1	32.47%	6.20%	6.20%	0.79%	79.07%	20.93%
P2	9.91%	1.79%	5.17%	0.62%	86.04%	13.96%
P3	10.17%	1.15%	4.39%	0.50%	90.63%	9.37%
P4	5.37%	0.87%	4.06%	0.46%	92.47%	7.53%
P5	4.83%	0.77%	4.00 % 3.81%	0.41%	93.93%	6.07%
P6	1.83%	0.79%	3.73%	0.40%	94.50%	5.50%
P7	2.41%	0.60%	3.61%	0.38%	95.06%	4.94%
P8	2.41% 1.14%	0.47%	3.56%	0.38%	95.28%	4.72%
P9	1.37%	0.32%	3.50%	0.38%	95.45%	4.55%
T	30.50%	0.32%	2.55%	0.00%	100.00%	4.55 % 0.00%
1	50.5070	0.0070	2.0070	Particle	100.0070	0.0070
No of test	Flotation	Copper ore		size	Type of	Dose of
NO OI test	machine	type		fraction	collector	collector
67	Denver	shale		100-125 µm	Z	100 g/Mg
Product		λ	β	100-125 μm θ	L ٤	
i iouuci	γ	Λ	р 7.73%	2.58%	0.00%	η 100.00%
P1	28.71%	6.95%	6.95%	0.82%	0.00 <i>%</i> 77.26%	22.74%
P1 P2	9.42%	0.93 <i>%</i> 1.87%	6.93% 5.70%	0.66%	84.08%	15.92%
P2 P3	9.42 <i>%</i> 6.57%	1.67 %	5.08%	0.66%	84.08% 87.87%	13.92%
P3 P4						
	2.30%	1.23%	4.89%	0.54%	88.96%	11.04%
P5	2.19%	0.94%	4.71%	0.52%	89.76%	10.24%
P6	2.41%	0.72%	4.53%	0.51%	90.43%	9.57%
P7	2.03%	0.70%	4.38%	0.50%	90.98%	9.02%

 $\mathbf{P7}$

P8

Р9

1.62%

0.85%

0.41%

0.75%

0.61%

0.53%

3.89%

3.84%

3.82%

0.45%

0.45%

0.45%

92.63%

92.84%

92.93%

7.37%

7.16% 7.07%

P8	0.75%	0.61%	4.33%	0.50%	91.16%	8.84%
P9	0.70%	0.54%	4.28%	0.50%	91.31%	8.69%
Т	44.91%	0.50%	2.58%	0.00%	100.00%	0.00%
No of test	Flotation machine	Copper ore type		Particle size fraction	Type of collector	Dose of collector
68	Denver	shale		100-125 μm	Ζ	150 g/Mg
Product	γ	λ	β	θ	ε	η
			7.47%	2.49%	0.00%	100.00%
P1	29.16%	6.69%	6.69%	0.76%	78.35%	21.65%
P2	9.68%	1.70%	5.45%	0.61%	84.96%	15.04%
P3	6.88%	1.14%	4.80%	0.55%	88.11%	11.89%
P4	2.93%	0.91%	4.57%	0.52%	89.18%	10.82%
P5	2.93%	0.85%	4.35%	0.51%	90.18%	9.82%
P6	3.01%	0.75%	4.16%	0.49%	91.09%	8.91%
P7	2.59%	0.74%	4.00%	0.47%	91.86%	8.14%
P8	1.36%	0.72%	3.92%	0.47%	92.25%	7.75%
Р9	1.17%	0.63%	3.86%	0.46%	92.55%	7.45%
Т	40.28%	0.46%	2.49%	0.00%	100.00%	0.00%
	Flatation	Common one		Particle	Trues of	Dece of
No of test	Flotation machine	Copper ore type		size fraction	Type of collector	Dose of collector
69	Denver	shale		125-200 μm	Е	100 g/Mg
Product	γ	λ	β	θ	ε	η
	1		7.38%	2.43%	0.00%	100.00%
P1	27.36%	6.60%	6.60%	0.86%	74.25%	25.75%
P2	12.35%	2.00%	5.17%	0.63%	84.41%	15.59%
P3	8.34%	1.20%	4.48%	0.54%	88.52%	11.48%
P4	3.86%	1.05%	4.22%	0.50%	90.19%	9.81%
P5	1.93%	0.95%	4.11%	0.48%	90.94%	9.06%
P6	1.11%	0.88%	4.04%	0.47%	91.34%	8.66%
P7	0.91%	0.75%	3.99%	0.46%	91.62%	8.38%
P8	0.33%	0.58%	3.97%	0.46%	91.70%	8.30%
Р9	0.75%	0.49%	3.92%	0.46%	91.85%	8.15%
Т	43.07%	0.46%	2.43%	0.00%	100.00%	0.00%
	T1 ()	6		Particle	T (
No of test	Flotation machine	Copper ore type		size fraction	Type of collector	Dose of collector
70	Denver	shale		125-200 μm	Е	150 g/Mg
Product		λ	β	9	E E	
i iouuci	γ	Λ	р 6.44%	3 2.50%	0.00%	η 100.00%
P1	35.70%	5.66%	0.44 % 5.66%	2.30 % 0.74%	80.93%	100.00 % 19.07%
P2	3.98%	5.00 % 1.98%	5.00 <i>%</i> 5.29%	0.74%	80.93 % 84.09%	19.07 % 15.91%
P2 P3	5.39%	1.98%	3.29% 4.82%	0.66%	84.09% 87.04%	13.91% 12.96%
Р3 Р4	5.39% 5.38%	1.37%	4.82% 4.43%	0.53%	87.04% 89.42%	12.96% 10.58%
P4 P5	5.38% 5.45%	0.94%	4.43% 4.09%	0.33%	89.42% 91.47%	10.58 % 8.53%
P5 P6	5.45% 1.96%	0.94%	4.09% 3.98%	0.48% 0.47%	91.47% 92.14%	8.55% 7.86%
F 0 D7	1.90%	0.00%	3.90 /0 2.900/	0.47 %	92.14 /0	7.00/0

Т	39.25%	0.45%	2.50%	0.00%	100.00%	0.00%
No of test	Flotation machine	Copper ore type		Particle size fraction	Type of collector	Dose of collector
71	Denver	shale		125-200 μm	Z	100 g/Mg
Product	γ	λ	β	θ	ε	η
			8.30%	2.40%	0.00%	100.00%
P1	22.94%	7.52%	7.52%	0.88%	71.85%	28.15%
P2	6.37%	2.58%	6.45%	0.72%	78.70%	21.30%
P3	5.03%	1.65%	5.74%	0.65%	82.15%	17.85%
P4	3.12%	1.41%	5.38%	0.62%	83.98%	16.02%
P5	3.31%	1.01%	5.03%	0.59%	85.37%	14.63%
P6	0.56%	0.83%	4.97%	0.59%	85.56%	14.44%
P7	0.67%	1.10%	4.91%	0.59%	85.87%	14.13%
P8	0.68%	0.90%	4.85%	0.58%	86.12%	13.88%
P9	0.94%	0.67%	4.76%	0.58%	86.38%	13.62%
Т	56.38%	0.58%	2.40%	0.00%	100.00%	0.00%
	Flotation	Copper ore		Particle	Type of	Dose of
No of test	machine	type		size fraction	collector	collector
72	Denver	shale		125-200 μm	Ζ	150 g/Mg
Product	γ	λ	β	θ	ε	η
			8.28%	2.43%	0.00%	100.00%
P1	24.50%	7.50%	7.50%	0.78%	75.65%	24.35%
P2	6.98%	2.13%	6.31%	0.65%	81.77%	18.23%
P3	5.99%	1.36%	5.52%	0.58%	85.12%	14.88%
P4	3.97%	1.07%	5.09%	0.54%	86.87%	13.13%
P5	2.69%	0.84%	4.83%	0.53%	87.80%	12.20%
P6	1.63%	0.84%	4.69%	0.52%	88.36%	11.64%
P7	0.84%	0.92%	4.62%	0.51%	88.68%	11.32%
P8	0.49%	0.95%	4.58%	0.51%	88.87%	11.13%
Р9	0.62%	1.17%	4.54%	0.50%	89.17%	10.83%
Т	52.27%	0.50%	2.43%	0.00%	100.00%	0.00%

Table A4. Averaged results of flotation test of dolomite copper ore in Jameson cell (E – water solution of ethyl sodium xanthate; Z – water solution of isobutyl sodium xanthate)

No of test	Flotation machine	Copper ore type	Particle size fraction	Type of collector	Dose of collector
73	Jameson	dolomite	0-25 μm	Ε	100 g/Mg
Product	γ	β	θ	ε	η
	0,00%	17,50%	1,64%	0,00%	100,00%
P1	0,44%	16,93%	1,58%	3,95%	96,05%
P2	1,87%	15,42%	1,35%	19,30%	80,70%
P3	4,61%	14,60%	0,97%	43,44%	56,56%
P4	6,75%	13,52%	0,78%	55,69%	44,31%
P5	8,58%	11,94%	0,67%	62,53%	37,47%
P6	9,80%	10,76%	0,65%	64,40%	35,60%
P7	12,04%	9,62%	0,55%	70,70%	29,30%
P8	14,18%	8,86%	0,45%	76,65%	23,35%

Р9	16,52%	7,94%	0,39%	80,02%	19,98%
Т	100,00%	1,64%	0,00%	100,00%	0,00%
No of test	Flotation machine	Copper ore type	Particle size fraction	Type of collector	Dose of collector
74	Jameson	dolomite	0-25 μm	Е	150 g/Mg
Product	γ	β	9 9	<u>۔</u> ٤	H
	0,00%	12,00%	1,22%	0,00%	100,00%
P1	1,04%	11,68%	1,12%	9,43%	90,57%
P2	2,38%	11,02%	0,96%	22,81%	77,19%
P3	4,02%	10,97%	0,81%	36,09%	63,91%
P4	5,33%	9,95%	0,73%	43,50%	56,51%
P5	7,36%	8,50%	0,64%	51,25%	48,75%
P6	10,46%	7,35%	0,62%	54,42%	45,58%
P7	13,71%	5,71%	0,51%	64,12%	35,88%
P8	16,99%	5,10%	0,43%	71,06%	28,94%
P9	20,45%	4,53%	0,37%	75,94%	24,06%
T	100,00%	1,22%	0,00%	100,00%	0,00%
-			Particle	· ·	
No of test	Flotation	Copper ore	size	Type of	Dose of
	machine	type	fraction	collector	collector
75	Jameson	dolomite	0-25 μm	Z	100 g/Mg
Product	γ	β	9.	ε	H
	0,00%	19,00%	1,77%	0,00%	100,00%
P1	1,05%	18,15%	1,61%	9,86%	90,14%
P2	2,39%	17,27%	1,37%	24,52%	75,48%
Р3	3,82%	16,65%	1,15%	37,32%	62,68%
P4	5,76%	14,89%	0,97%	48,45%	51,55%
P5	8,20%	12,70%	0,79%	58,80%	41,20%
P6	11,10%	10,87%	0,63%	68,16%	31,84%
P7	14,10%	9,36%	0,52%	74,61%	25,39%
P8	16,65%	8,33%	0,46%	78,34%	21,66%
Р9	18,98%	7,55%	0,42%	81,00%	19,00%
Т	100,00%	1,77%	0,00%	100,00%	0,00%
			Particle		
No of test	Flotation	Copper ore	size	Type of	Dose of
	machine	type	fraction	collector	collector
76	Jameson	dolomite	0-25 μm	Ζ	150 g/Mg
	γ	β	θ	ε	Н
	0,00%	17,50%	0,99%	0,00%	100,00%
P1	0,70%	16,88%	0,88%	11,87%	88,13%
P2	1,32%	15,90%	0,79%	21,26%	78,74%
Р3	2,09%	15,10%	0,69%	31,88%	68,12%
P4	2,73%	13,90%	0,63%	38,30%	61,70%
P5	3,46%	12,44%	0,58%	43,47%	56,53%
P6	4,12%	11,08%	0,56%	46,15%	53,85%
	4,1Z/0	11,0070			
P7	4,12 % 5,42%	9,26%	0,52%	50,68%	49,32%
	5,42%	9,26%			
P7			0,52% 0,48% 0,44%	50,68% 54,95% 59,33%	49,32% 45,05% 40,68%

No of test	Flotation machine	Copper ore type	Particle size fraction	Type of collector	Dose of collector
77	Jameson	dolomite	25-45 μm	Е	100 g/Mg
Product	γ	β	θ	ε	Н
	0,00%	8,00%	1,55%	0,00%	100,00%
P1	0,79%	7,59%	1,50%	3,85%	96,15%
P2	1,52%	7,37%	1,46%	7,22%	92,78%
P3	2,39%	7,57%	1,40%	11,67%	88,33%
P4	3,36%	7,40%	1,35%	16,03%	83,97%
P5	4,06%	7,51%	1,30%	19,67%	80,33%
P6	4,54%	7,53%	1,27%	22,04%	77,96%
P7	5,30%	7,57%	1,21%	25,84%	74,16%
P8	5,84%	7,33%	1,19%	27,61%	72,39%
Р9	8,84%	6,21%	1,10%	35,44%	64,56%
Т	100,00%	1,55%	0,00%	100,00%	0,00%
			Particle		
No of test	Flotation machine	Copper ore type	size fraction	Type of collector	Dose of collector
78	Jameson	dolomite	25-45 μm	Е	150 g/Mg
Product	γ	β	ب	8	H
	0,00%	7,00%	1,54%	0,00%	100,00%
P1	0,25%	6,73%	1,52%	1,09%	98,91%
P2	0,51%	7,45%	1,51%	2,46%	97,54%
P3	0,89%	7,50%	1,48%	4,32%	95,68%
P4	1,16%	7,65%	1,47%	5,80%	94,20%
P5	1,72%	7,42%	1,43%	8,29%	91,71%
P6	2,17%	7,35%	1,41%	10,36%	89,64%
P7	2,81%	6,84%	1,38%	12,48%	87,52%
P8	3,51%	6,75%	1,35%	15,42%	84,58%
Р9	4,55%	6,24%	1,31%	18,47%	81,53%
Т	100,00%	1,54%	0,00%	100,00%	0,00%
			Particle		
No of test	Flotation	Copper ore	size	Type of collector	Dose of
	machine	type	fraction	collector	collector
79	Jameson	dolomite	25-45 μm	Z	100 g/Mg
Product	γ	β	θ	ε	Н
	0,00%	7,00%	1,13%	0,00%	100,00%
P1	0,57%	6,43%	1,10%	3,23%	96,77%
P2	1,10%	7,11%	1,06%	6,94%	93,06%
P3	1,72%	7,72%	1,01%	11,74%	88,26%
P4	2,50%	6,94%	0,98%	15,36%	84,64%
P5	3,68%	5,91%	0,95%	19,25%	80,75%
P6	4,72%	5,32%	0,92%	22,22%	77,78%
P7	6,54%	4,63%	0,88%	26,80%	73,20%
P8	8,31%	4,06%	0,86%	29,88%	70,12%
Р9	11,28%	3,53%	0,82%	35,28%	64,72%
Т	100,00%	1,13%	0,00%	100,00%	0,00%
No of test	Flotation machine	Copper ore type	Particle size	Type of collector	Dose of collector

			fraction		
80	Jameson	dolomite	25-45 µm	Ζ	150 g/Mg
Products	γ	β	θ	ε	Н
	0,00%	17,00%	1,30%	0,00%	100,00%
P1	0,74%	16,33%	1,18%	9,38%	90,62%
P2	1,55%	14,27%	1,09%	17,03%	82,97%
P3	2,87%	12,78%	0,96%	28,28%	71,72%
P4	4,21%	11,51%	0,85%	37,41%	62,59%
P5	5,44%	10,29%	0,78%	43,25%	56,75%
P6	6,84%	9,01%	0,73%	47,60%	52,40%
P7	8,31%	7,94%	0,69%	50,91%	49,09%
P8	9,71%	7,28%	0,65%	54,60%	45,40%
Р9	11,14%	6,65%	0,62%	57,25%	42,75%
Т	100,00%	1,30%	0,00%	100,00%	0,00%
	F1 4 4	6	Particle	T (D (
No of test	Flotation	Copper ore	size	Type of	Dose of
	machine	type	fraction	collector	collector
81	Jameson	dolomite	45-75 μm	Ε	100 g/Mg
Product	γ	β	θ	ε	Н
	0,00%	8,00%	1,19%	0,00%	100,00%
P1	0,31%	7,25%	1,17%	1,89%	98,11%
P2	0,68%	6,34%	1,16%	3,61%	96,39%
P3	1,29%	6,03%	1,13%	6,51%	93,49%
P4	1,70%	6,07%	1,11%	8,69%	91,32%
P5	2,24%	6,04%	1,08%	11,34%	88,66%
P6	3,01%	5,77%	1,05%	14,59%	85,41%
P7	3,77%	5,23%	1,03%	16,59%	83,41%
P8	4,57%	5,27%	0,99%	20,23%	79,77%
Р9	6,16%	4,92%	0,95%	25,49%	74,51%
Т	100,00%	1,19%	0,00%	100,00%	0,00%
			Particle		
No of test	Flotation	Copper ore	size	Type of	Dose of
	machine	type	fraction	collector	collector
82	Jameson	dolomite	45-75 μm	Ε	150 g/Mg
Product	γ	β	9	ε	H
	0,00%	•	1,10%	0,00%	100,00%
P1	0,00% 0,80%	7,00%	-		100,00% 95,50%
P1 P2	0,80%	7,00% 6,22%	1,10% 1,06% 1,04%	4,50%	95,50%
	0,80% 1,19%	7,00% 6,22% 6,32%	1,06% 1,04%	4,50% 6,81%	95,50% 93,19%
Р2 Р3	0,80% 1,19% 1,72%	7,00% 6,22% 6,32% 6,65%	1,06% 1,04% 1,00%	4,50% 6,81% 10,36%	95,50% 93,19% 89,64%
P2 P3 P4	0,80% 1,19% 1,72% 2,01%	7,00% 6,22% 6,32% 6,65% 6,78%	1,06% 1,04% 1,00% 0,98%	4,50% 6,81% 10,36% 12,40%	95,50% 93,19% 89,64% 87,60%
P2 P3 P4 P5	0,80% 1,19% 1,72% 2,01% 2,62%	7,00% 6,22% 6,32% 6,65% 6,78% 6,57%	1,06% 1,04% 1,00% 0,98% 0,95%	4,50% 6,81% 10,36% 12,40% 15,62%	95,50% 93,19% 89,64% 87,60% 84,38%
P2 P3 P4 P5 P6	0,80% 1,19% 1,72% 2,01% 2,62% 3,11%	7,00% 6,22% 6,32% 6,65% 6,78% 6,57% 6,40%	1,06% 1,04% 1,00% 0,98% 0,95% 0,93%	4,50% 6,81% 10,36% 12,40% 15,62% 18,11%	95,50% 93,19% 89,64% 87,60% 84,38% 81,89%
P2 P3 P4 P5 P6 P7	0,80% 1,19% 1,72% 2,01% 2,62% 3,11% 4,17%	7,00% 6,22% 6,32% 6,65% 6,78% 6,57% 6,40% 5,90%	1,06% 1,04% 1,00% 0,98% 0,95% 0,93% 0,89%	4,50% 6,81% 10,36% 12,40% 15,62% 18,11% 22,35%	95,50% 93,19% 89,64% 87,60% 84,38% 81,89% 77,65%
P2 P3 P4 P5 P6 P7 P8	0,80% 1,19% 1,72% 2,01% 2,62% 3,11% 4,17% 5,23%	7,00% 6,22% 6,32% 6,65% 6,78% 6,57% 6,40% 5,90% 5,73%	1,06% 1,04% 1,00% 0,98% 0,95% 0,93% 0,89% 0,85%	4,50% 6,81% 10,36% 12,40% 15,62% 18,11% 22,35% 27,18%	95,50% 93,19% 89,64% 87,60% 84,38% 81,89% 77,65% 72,82%
P2 P3 P4 P5 P6 P7 P8 P9	0,80% 1,19% 1,72% 2,01% 2,62% 3,11% 4,17% 5,23% 6,69%	7,00% 6,22% 6,32% 6,65% 6,78% 6,57% 6,40% 5,90% 5,73% 5,30%	1,06% 1,04% 1,00% 0,98% 0,95% 0,93% 0,89% 0,85% 0,80%	4,50% 6,81% 10,36% 12,40% 15,62% 18,11% 22,35% 27,18% 32,17%	95,50% 93,19% 89,64% 87,60% 84,38% 81,89% 77,65% 72,82% 67,83%
P2 P3 P4 P5 P6 P7 P8	0,80% 1,19% 1,72% 2,01% 2,62% 3,11% 4,17% 5,23% 6,69% 100,00%	7,00% 6,22% 6,32% 6,65% 6,78% 6,57% 6,40% 5,90% 5,73%	1,06% 1,04% 1,00% 0,98% 0,95% 0,93% 0,89% 0,85% 0,80% 0,80%	4,50% 6,81% 10,36% 12,40% 15,62% 18,11% 22,35% 27,18% 32,17% 100,00%	95,50% 93,19% 89,64% 87,60% 84,38% 81,89% 77,65% 72,82% 67,83% 0,00%
P2 P3 P4 P5 P6 P7 P8 P9 T	0,80% 1,19% 1,72% 2,01% 2,62% 3,11% 4,17% 5,23% 6,69% 100,00% Flotation	7,00% 6,22% 6,32% 6,65% 6,78% 6,57% 6,40% 5,90% 5,73% 5,30%	1,06% 1,04% 1,00% 0,98% 0,95% 0,93% 0,89% 0,85% 0,80% 0,00% Particle	4,50% 6,81% 10,36% 12,40% 15,62% 18,11% 22,35% 27,18% 32,17% 100,00% Type of	95,50% 93,19% 89,64% 87,60% 84,38% 81,89% 77,65% 72,82% 67,83% 0,00% Dose of
P2 P3 P4 P5 P6 P7 P8 P9	0,80% 1,19% 1,72% 2,01% 2,62% 3,11% 4,17% 5,23% 6,69% 100,00%	7,00% 6,22% 6,32% 6,65% 6,78% 6,57% 6,40% 5,90% 5,73% 5,30% 1,10%	1,06% 1,04% 1,00% 0,98% 0,95% 0,93% 0,89% 0,85% 0,80% 0,80%	4,50% 6,81% 10,36% 12,40% 15,62% 18,11% 22,35% 27,18% 32,17% 100,00%	95,50% 93,19% 89,64% 87,60% 84,38% 81,89% 77,65% 72,82% 67,83% 0,00%

Product	γ	β	θ	3	Н
	0,00%	10,00%	1,82%	0,00%	100,00%
P1	0,23%	9,57%	1,80%	1,23%	98,77%
P2	0,64%	7,38%	1,78%	2,59%	97,41%
P3	1,26%	7,17%	1,75%	4,96%	95,04%
P4	2,07%	6,74%	1,71%	7,67%	92,33%
P5	2,77%	6,19%	1,69%	9,44%	90,56%
P6	3,49%	5,71%	1,68%	10,96%	89,04%
P7	4,43%	5,44%	1,65%	13,23%	86,77%
P8	5,37%	5,11%	1,63%	15,08%	84,92%
Р9	6,48%	4,69%	1,62%	16,71%	83,29%
Т	100,00%	1,82%	0,00%	100,00%	0,00%
No of test	Flotation machine	Copper ore type	Particle size fraction	Type of collector	Dose of collector
84	Jameson	dolomite	45-75 μm	Z	150 g/Mg
Product	γ	β	θ	ε	Н
Product	γ 0,00%	β 8,00%	ণ্ড 2,17%	ε 0,00%	H 100,00%
Product P1	-				
	0,00%	8,00%	2,17%	0,00%	100,00%
P1	0,00% 0,54%	8,00% 7,05%	2,17% 1,79%	0,00% 1,73%	100,00% 98,27%
P1 P2	0,00% 0,54% 1,24%	8,00% 7,05% 7,06%	2,17% 1,79% 1,75%	0,00% 1,73% 4,04%	100,00% 98,27% 95,96%
P1 P2 P3	0,00% 0,54% 1,24% 2,45%	8,00% 7,05% 7,06% 6,19%	2,17% 1,79% 1,75% 1,71%	0,00% 1,73% 4,04% 6,97%	100,00% 98,27% 95,96% 93,03%
P1 P2 P3 P4	0,00% 0,54% 1,24% 2,45% 3,35%	8,00% 7,05% 7,06% 6,19% 5,96%	2,17% 1,79% 1,75% 1,71% 1,68%	0,00% 1,73% 4,04% 6,97% 9,18%	100,00% 98,27% 95,96% 93,03% 90,82%
P1 P2 P3 P4 P5	0,00% 0,54% 1,24% 2,45% 3,35% 4,50%	8,00% 7,05% 7,06% 6,19% 5,96% 5,58%	2,17% 1,79% 1,75% 1,71% 1,68% 1,64%	0,00% 1,73% 4,04% 6,97% 9,18% 11,56%	100,00% 98,27% 95,96% 93,03% 90,82% 88,44%
P1 P2 P3 P4 P5 P6	0,00% 0,54% 1,24% 2,45% 3,35% 4,50% 5,89%	8,00% 7,05% 7,06% 6,19% 5,96% 5,58% 5,36%	2,17% 1,79% 1,75% 1,71% 1,68% 1,64% 1,60%	0,00% 1,73% 4,04% 6,97% 9,18% 11,56% 14,53%	100,00% 98,27% 95,96% 93,03% 90,82% 88,44% 85,48%
P1 P2 P3 P4 P5 P6 P7	0,00% 0,54% 1,24% 2,45% 3,35% 4,50% 5,89% 7,80%	8,00% 7,05% 7,06% 6,19% 5,96% 5,58% 5,36% 5,29%	2,17% 1,79% 1,75% 1,71% 1,68% 1,64% 1,60% 1,53%	0,00% 1,73% 4,04% 6,97% 9,18% 11,56% 14,53% 18,96%	100,00% 98,27% 95,96% 93,03% 90,82% 88,44% 85,48% 81,04%