

New Customized Collector Blend Shows Improved Cu Recovery

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Summary

Using its proprietary FLOTATION MATRIX 100™ process for mineral flotation, Cytec has developed a number of new reagents that are delivering measurable improvements over existing technology.

Two such novel collector formulations, AERO®XD905 promoter and AERO® XD904 promoter, have shown considerable promise in rejecting Acid Soluble (AS) Cu and recovering Acid Insoluble (AI) Cu at one of Cytec's concentrator customers. These two products have been tested on underground ore and open pit ore circuits. AERO XD905 promoter is the optimum product for use on the underground ore circuit as it shows a significant reduction in AS Cu recovery while maintaining AI Cu recovery. On the open pit ore circuit, AERO XD904 promoter is recommended since it demonstrated a potential 2-3% improvement in AI Cu recovery.

AERO XD905 and AERO XD904 are specialty collector blends containing newly commercialized AERO XD5002

collector as a base. Proper formulation blending based on this collector has created products that can significantly reduce reagent consumption while improving performance related to selectivity, recovery, and/or grade for target ore bodies. One example of the benefits that can be achieved from the new collector in a properly formulated product is highlighted below.

Test Work Procedure

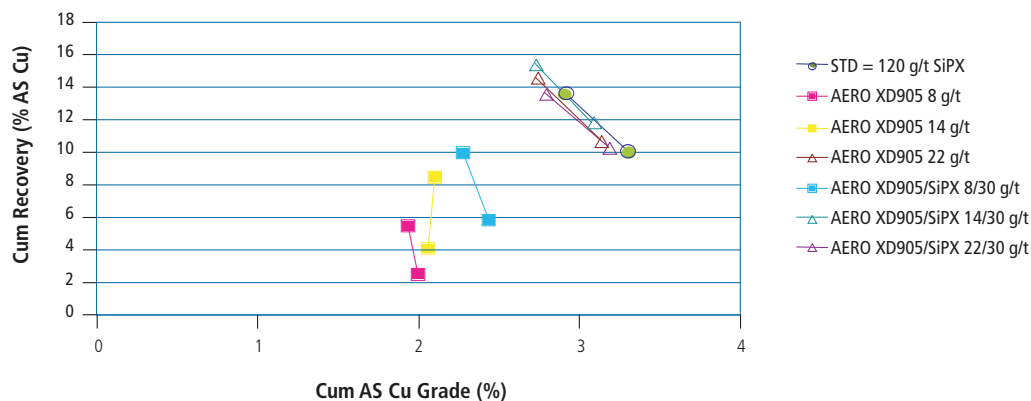
Laboratory flotation tests were performed on samples of underground ore and open pit ore slurries that were sampled from the conditioning agitators prior to reagent addition. Tests were run using the Denver Laboratory Flotation Machine in a 4.5 liter cell. In some tests single rougher concentrates were taken over six minutes, while in others concentrates were taken over two and six minutes cumulative.

Results and Discussion

Although many tests were conducted, only results of the more relevant tests will be mentioned.

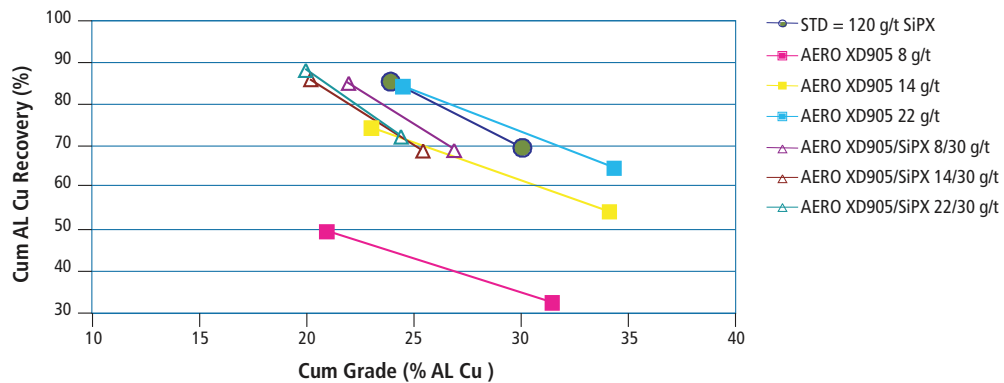
Underground Ore

Figure 1
Roughers AS Cu Grade Recovery



2 Customized Collector Blend

Figure 2
Roughers AI Cu Grade Recovery



In the first day of test work on underground ore, AERO XD905 promoter was tested at 8 g/t, 14 g/t and 22 g/t both alone and with 30 g/t SiPX.

Comparison was made to the standard of 120 g/t SiPX. Three standard tests were run and the data in the graph shown above is for the average of those three standard tests.

Results were extremely encouraging, with the 22 g/t AERO XD905 promoter giving almost equivalent AI grade/recovery to the standard while recovering much less AS Cu (9.9% versus 13.6%). Although the tests using AERO XD905 promoter with xanthate only recovered equivalent AI Cu to the standard, they did so at much lower dosage (14 g/t + 30 g/t replacing 120 g/t SiPX).

In the second day of test work on underground ore, a single test with AERO XD905 promoter at 25 g/t was compared to three standard tests at 120 g/t SiPX. Note: head grade was extremely low on this day at only 1.1% AI Cu, resulting in low grade concentrates.

Only a single concentrate was taken so results have not been plotted.

In this test the AERO XD905 promoter achieved higher AI Cu grade/recovery than the combined standards (86.9%/13.7% vs 85.3%/12.77%) although the reduction in AS Cu grade/recovery was not as large as had been seen earlier (14.7%/1.95% versus 15.9%/2.10%).

Overall AERO XD905 promoter appears to be very effective for flotation of the underground ore. It appears to show selectivity against AI Cu while maintaining AI Cu grade/recovery.

Table 1
Day 1 Results, Underground Ore

| Collector | Dosage (g/t) | C1 Cum wt % | C2 Cum wt % | C1 Cum % AICu | C2 Cum % AICu | C1 Cum AICu rec % | C2 Cum AICu rec % | C1 Cum % ASCu | C2 Cum % ASCu | C1 Cum ASCu rec % | C2 Cum ASCu rec % |
|------------------|--------------|-------------|-------------|---------------|---------------|-------------------|-------------------|---------------|---------------|-------------------|-------------------|
| SiPX | 120 | 3.7 | 5.8 | 30.4 | 24.2 | 69.7 | 85.6 | 3.3 | 2.9 | 10.1 | 13.6 |
| AERO XD905 | 8 | 1.6 | 3.7 | 31.9 | 21.3 | 32.5 | 49.5 | 2.0 | 1.94 | 2.5 | 5.4 |
| AERO XD905 | 14 | 2.5 | 5.0 | 34.6 | 23.4 | 54.3 | 74.3 | 2.1 | 2.1 | 4.1 | 8.4 |
| AERO XD905 | 22 | 3.0 | 5.4 | 34.8 | 24.8 | 64.7 | 84.3 | 2.4 | 2.3 | 5.8 | 9.9 |
| AERO XD905/SiPX | 8+30 | 4.0 | 6.0 | 27.2 | 22.2 | 69.3 | 85.1 | 3.2 | 2.8 | 10.4 | 13.6 |
| AERO XD905/SiPX | 14+30 | 4.3 | 6.6 | 25.7 | 20.5 | 69.0 | 85.8 | 3.1 | 2.7 | 10.7 | 14.6 |
| AERO XD905/ SiPX | 22+30 | 4.8 | 7.1 | 24.7 | 20.3 | 72.5 | 88.2 | 3.1 | 2.7 | 11.8 | 15.4 |

Open Pit Ore

Seventeen different collectors were compared to the standard on open pit ore with optimum results being achieved with AERO XD904 promoter. AERO XD904 promoter at 35 g/t was compared to the standard of 80 g/t SiPX. AERO XD904 promoter was tested in duplicate and the standard in triplicate.

Since only a single concentrate was taken, results have not been plotted. AERO XD904 promoter gives a significant improvement in AI Cu recovery (82.2% vs 79.1%) although at a lower concentrate grade (25.2% vs 29.9%). Concentrate AS Cu grade was lower with AERO XD904 promoter than the standard (1.2% vs 1.4%), although recovery was slightly higher due to the higher mass pulled (9.4% vs 8.8%).

Next Steps

After the blend is developed and results confirmed in controlled laboratory testing, the next step is verification of performance in commercial trials.

For this example, a short plant test was recommended using determine likely reduction in AS Cu flotation. A longer trial of AERO XD904 promoter would be necessary on the open pit ore circuit to determine improvements in AI Cu recovery. Actual trial lengths/protocols can be determined only after an analysis of current plant data using REF DIST (Cytec's proprietary software for preparation of relevant plant trials and data evaluation).

More details on the statistical approaches used to develop the custom blend and evaluate test results are available from your Cytec Mining Chemicals representative.

AERO XD905 promoter on the underground ore circuit to determine likely reduction in AS Cu flotation. A longer trial of AERO XD904 promoter would be necessary on the open pit ore circuit to determine improvements in AI Cu recovery. Actual trial lengths/protocols can be determined only after an analysis of current plant data using REF DIST (Cytec's proprietary software for preparation of relevant plant trials and data evaluation).

More details on the statistical approaches used to develop the custom blend and evaluate test results are available from your Cytec Mining Chemicals representative.

Table 2
Day 2 Results, Underground Ore

| Collector | Dosage (g/t) | Conc wt % | Conc % AICu | Conc AICu rec % | Conc % ASCu | Conc ASCu rec % |
|------------|--------------|-----------|-------------|-----------------|-------------|-----------------|
| SiPX | 120 | 7.0 | 12.8 | 84.9 | 2.10 | 16.1 |
| AERO XD905 | 25 | 7.1 | 13.7 | 86.9 | 1.95 | 14.7 |

Table 3
Open Pit Ore Results

| Collector | Dosage (g/t) | Conc wt % | Conc % AICu | Conc AICu rec % | Conc % ASCu | Conc ASCu rec % |
|------------|--------------|-----------|-------------|-----------------|-------------|-----------------|
| SiPX | 80 | 2.6 | 29.9 | 79.1 | 1.38 | 8.8 |
| AERO XD904 | 35 | 3.2 | 25.2 | 82.2 | 1.20 | 9.4 |

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