

ADVANCED ION EXCHANGE: SELECTIVE RECOVERY AND PURIFICATION OF ZINC SULFATE AND COBALT LEACH SOLUTIONS

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ABSTRACT

Two base metal streams were identified for potential value recovery and product quality improvement through the selective removal of metals prior to product precipitation using silica-based advance ion exchange resins. The focus of the test work was to establish baseline resin performance such as metals selectivity and loading capacity in the two mixed metals streams. Stream 1 is a zinc sulfate leach solution containing Cd, Al, Cu and Ni as impurities. The zinc sulfate solution is further processed to agricultural grade zinc sulfate monohydrate. Stream 2 is a cobalt leach solution containing Cu, Ni, Zn and Mg as impurities with concentrations that prevent the final cobalt product from achieving battery grade concentrations.

Batch isotherm resin tests were conducted to establish the baseline performance of various resins from PQ Corporation's AlphaSelect silica resin range. Adsorption tests were performed over a 24-hour period to establish resin selectivity and capacity. Sulfuric acid at 2M and 0.5M was used to evaluate the elution efficiency at different acid concentrations. A CdSelect resin was manufactured by PQ with two different particle sizes (60 µm and 90µm) to further test the resin size effect on loading capacity. The CdSelect resin was tested for Cd removal from the zinc sulfate solution. Duplicate samples were conducted on all batch tests for repeatability.

This paper covers the preliminary process design, mass balances and economic feasibility based on the resin performance and achievable stream compositions through the implementation of silica-based ion exchange resins in both base metal stream applications.

Keywords: Ion exchange, zinc, cobalt, purification, selective recovery