

THE POTENTIAL TO TOLL MILL CONGO COPPER COBALT OXIDE ORES

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ABSTRACT

Testwork on composites were used to develop a simple process flowsheet to enable the sale of marketable products. The process involves crushing the ore and then feeding the crushed ore into bins. The material is withdrawn from ore bins into one of two ball mills that operate in closed circuit with cyclones, with cyclone overflow being held in slurry storage tanks. Slurry is pumped from the holding tanks to leaching tanks where sulphuric acid and SMBS are added to solubilise metal and adjust the solution ORP to convert Co(III) into acid soluble Co(II). The liquor is then neutralised to pH ~4 using hydrated lime and air blown into the tanks to allow oxidation of Fe(II) to Fe(III) thereby allowing its precipitation from solution.

The slurry from leaching/neutralisation is filtered in plate-and-frame filters, and washed with water, with the liquor and wash water combined and directed to the Cu precipitation storage tank. The solids dumped from the filter press are conveyed to the tailings storage pad and dry-stacked. Liquor run-off from the dry-stack pad is collected and returned to the process water tank.

Liquor in the Cu precipitation holding tank is pumped to copper precipitation tanks, where the pH is adjusted to pH ~7 with slaked lime, thereby effecting the precipitation of copper. The precipitated copper is recovered in plate-and-frame filter presses, and the liquor is directed to the cobalt precipitation holding tanks. The copper product is dried – if necessary – and then packaged and trucked to a nearby copper refinery for dissolution and production of cathode copper.

Liquor from the cobalt precipitation holding tank is pumped to the cobalt precipitation tanks, where the pH is adjusted to pH ~8.5 with magnesia. Precipitated cobalt is recovered by filtration in a filter press, with liquor directed to the process water tank; a portion of this water will likely need to be bled to an impurity removal circuit where impurities such as Mn and MgO are removed. The cobalt hydroxide product is dried – using a combination of solar drying and fuel drying – after which it is packaged, loaded into sea containers and freighted to markets overseas.

Keywords: cobalt, copper, DRC, grinding, impurities, leaching, precipitation, toll milling,