Emerging technologies in cyanidation of gold and silver: a glance at some of the latest contributions

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Abstract

Research and development in gold and silver mining have been motivated by decreasing grade of deposits, more complex mineralogy, increasing labour and energy costs, and efforts to reduce the footprint of the process. New technologies were developed in the last two decades, to improvement cyanidation practices. This paper discusses three of the emerging technologies that contributed to the development: leaching of ultrafine grind sulphide flotation concentrates, processing of sulphide bearing gold ores containing aurostibite, and extraction of gold and silver from high grade deposits with a technology called CELP (CANMET Enhanced Leaching Process).

For the KCGM ultrafine concentrate, using high lime concentration, lead nitrate and low DO in improved cyanide consumption, leaching kinetics as well as overall gold extraction. Pretreatment with lead nitrate and low DO produced fast leaching kinetics, low cyanide consumption and high extraction of gold for the Eleonore pyrrhotite concentrate. Aurostibite, a gold antimony mineral ($AuSb_2$), converts to $AuSbO_3$ in alkaline solution, reducing the extraction of gold. The usual process to recover gold from ores containing aurostibite is flotation, pretreatment of the concentrate in aqueous solution with lead nitrate and leaching in a pipe reactor at 9 MPa oxygen, pH 7 and 20 g/L NaCN. A new approach, using only 250 ppm NaCN, lead nitrate, atmospheric pressure and ambient temperature showed that gold was efficiently extracted from an ore containing aurostibite. For the treatment of high grade silver-gold ores (> 100 g/t Ag) efficient cyanidation of high grade silver-gold ores (> 100 g/t Ag) was possible with only 500 ppm NaCN. Low consumption of cyanide and low effluent treatment costs were obtained.

Keywords: Gold, silver, extraction, sulphide, cyanide.