

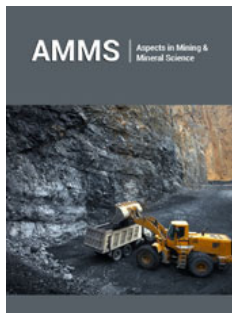
A Case Report on Cyanidation of Gold Heap Tailings at Agbash Mine in South Darfur State (Sudan)

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Summary

This case report aimed to determine the main side effects that prevent the possibility of re-leaching gold heap tailings and to test the viability of applying this technique to process these heap tailings in the Agbash mine, South Darfur state, the ores containing more than 1MT of 18% Au. Besides that, the most difficulties were faced, such as the pre-treated ores with mercury, which makes our further ore processing consume more reagents and cost; thus, wild animals in the Radom biosphere reserve around the Agbash mine, dense forests and the population density around the area. Moreover, the poverty that spread among the citizens in that region made the peoples don't care about precautions and safety to obtain gold; therefore, the bad usage of mercury to recover gold by traditional methods had to result highly spreads of diseases in the area. Some animals and birds died as a result of drinking contaminated water. Ultimately, despite all difficulties that were faced, the laboratory test showed that the re-leaching technique of heaps of tailings achieved more than 82% rate recovery.

Keywords: Cyanidation; Hofrat en nehas; Agbash mine; Gold tailings; Radom biosphere reserves; Leaching technique

Introduction

The Agbash (Bata bang) mines and operations are located in a remote area within the South Darfur State of Sudan, in Songo district, Nyala city, Darfur province, Sudan; the mines lie south-southwest of Nyala, approximately 310 kilometres in a crow line, south of Hofrat En Nahas approximately (42-45) Kilometer, its area is roughly contiguous with the Radom biosphere reserve, It is located among the forested Savanna and covers nearly 155,399 hectares, which lies within the southwestern part of country savanna woodland. A national park recognized by United Nations [1] and to the west by the border with the Central Africa Republic (C.A.R.), it is within the western part of the Southern Darfur and Bahr el Ghazal provinces in South Sudan [2,3].

Justification of the Case Report

- The high rise in gold prices in the global metals markets made it a strategic metal.
- A large reserve of gold heap tailings was found in Agbash (Bata bang) mine, which made many companies interested in processing it via the C.I.L. technique or the repeating heap leaching technique. However, this technique has a lower recovery than the C.I.L. by more than 10%.

Case Report Problem

- The gold ore heaps in the agbash mine have been previously processed with mercury, which makes it dangerous to use, especially ore handling, due to the toxicity resulting from mercury; it might cause cancer in humans.

- b. Associated minerals found with gold ore, such as Iron and Copper, might consume high-reagents dosage.
- c. The radom biosphere reserve surrounding the Agbash mine includes a very large group of wild animals.
- d. As a result, in the dense forests near the Agbash mine, the adsorption chemicals from mining activities negatively affect trees.

Gold Ore Samples (Heap Tailings)

About 16kg of representative samples were collected from the heaps tailing of Agbash mine and used throughout all the laboratory tests. Agbash region consists of several heaps amalgamated by mercury and still contains a remarkable amount of gold.

Gold Cyanidation Test Work

The cyanidation test in this case report was performed via laboratory agitation tank (bottle-roll tests), sodium cyanide NaCN used as a leaching reagent, CaO and H₂SO₄ to adjust the Ph of slurry. The tests were conducted to see which size of the sample gives the highest recovery of gold, based on the added chemicals, and which size consumes fewer chemicals and cyanide. Whereas the information from these tests was used to develop more intricate leaching and recovery circuits or evaluate an entire process. The characteristics of the samples influenced the procedure for these tests. In addition, the amount, laboratory facilities and testing equipment available.

Based on the result of the tests, in this case, it can be concluded that:

- a. The processing tests have shown that the heap's tailings of the Agbash mine are amenable to C.I.L. leaching even at a coarse particle size of around 5mm.
- b. The result from agitation tanks (open vessels) was good, and the recovery rate rose with fine sizes; also, it could be said that oxygen is necessary for this process.

- c. The traditional sodium cyanide process technology of gold extraction is very difficult to extract gold from ore with high arsenic, sulfur and lead, copper, zinc, iron, antimony and other tailings slag.
- d. Chemical analysis of the representative gold ore sample of Agbash mine indicated that the ore contains an average grade of 18g/t, which is good for a C.I.L. or heap leaching operations.

Recommendations

As long as artisan miners continue using harmful chemicals in the Agbash mine, achieving too much environmental protection of the radom biosphere reserve isn't possible. Therefore, the following recommendations would not be useful only if artisanal goldminers and citizens follow international policies for the preservation of the environment.

- a. To treat gold heap tailing in an Agbash mine, it must use environmentally friendly chemicals that are not harmful.
- b. Artisanal gold mining by mercury must be immediately stopped due to damage that happened to the environment via its uses.
- c. Must be a rehabilitation of radom biosphere national park to be attractive for wildlife instead of migrating. All artisanal gold mining within the protected area is illegal.

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