

Recently, Law 1658 issued on July 15 of the year 2013 by the Congress of the Republic of Colombia came into force, “through which provisions are established for the commercialization and use of mercury in the different industrial activities of the country, requirements and incentives are set for their reduction and elimination, and other provisions are dictated. “ This law mandated that mercury must be eliminated from the entire national territory, in all industrial processes in a period of 10 years and in a period of 5 years for mining activities that use amalgamation.

Since July 16 of this year, the use of mercury is completely prohibited in all mining processes in Colombia; therefore, miners or organizations with mining titles and environmental licenses must dispense with this substance to continue their activities. The reason for this prohibition is that mercury causes negative and irreversible effects on human health and all types of natural ecosystems, and there is ample epidemiological documentation in this regard.

Due to the implementation of Law 1658, some national companies have had to modify their production processes in order to dispense mercury as raw material for their processes (e.g. Production of chlorinated and energy-saving light bulbs). However, despite the efforts made by governmental organizations for the elimination of mercury in artisanal and small-scale mining, some factors such as the culture of the populations that perform this activity, the lack of basic technical education of the miners, and even corruption in the entities involved has hindered the technological transformation in this productive sector.

Although studies have been conducted in artisanal mining communities (mainly in the department of Cauca), none of these studies has offered concrete and tangible solutions to remove mercury in these processes. Therefore, it is essential to propose and develop technological alternatives that are easily appropriated for these communities.

In Colombia, small-scale gold mining can be classified as artisanal or non-technical, although it is considered an important productive sector of the country that generates high income. The department of Cauca is one of the most important territories, next to the department of Antioquia, where traditional mining activities are one of the main means of subsistence among its inhabitants.

Most artisanal gold miners use the amalgamation process to separate the metal from the ore. Nevertheless, as of July 16, 2018, mercury cannot be used in any mining activity throughout the national territory, leaving small miners in a precarious situation of unemployment or illegality. In some parts of the country, such as the municipalities of Suarez, Buenos Aires and El Tambo in the department of Cauca, studies have been conducted focused on proposing and applying alternative gold concentration processes that are capable of replacing the amalgamation process to 100%; but most of these studies have been theoretical or raise little accessible processes for a small-scale miner.

It is important to note that the particle size determines the type of gold extraction process that must be applied and the degree of particle release. In this sense, the operations of crushing and grinding must be optimized to reach the appropriate sizes to apply different technologies to amalgamation such as cyanidation, gravimetric concentration, and extraction with Borax, among others. Although these can also be highly polluting, they do not have the danger of the indiscriminate use of mercury.

If the particle size is suitable for obtaining free gold, then it is possible to achieve separation by means of gravimetric concentration. This method uses gravity and vibrating surfaces to separate minerals of different densities, but the recovery of gold in the mineral is highly dependent on the particle release size obtained in the comminution processes. In the case that the gold is present or remains in the mineral in molecular form or highly linked to other substances, such as pyrite or pyrite tracing, alternative methods such as flotation or cyanidation must be applied. The purpose of these technologies is to trap micrometric gold particles by means of the addition of chemical substances (surfactants or cyanide) and concentrate it in a solution and then separate it. For these processes, the exact gold/chemical ratio will be determined to avoid excessive use of toxic substances and reduce the production of polluting sludge.

This particular case raises one of the many challenges that the academy has, i.e. the research groups of our universities who with their participation could respond to this type of needs and in the process contribute to the attention of problems with a high environmental and social component for the country.

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