Finding alternatives to mercury in small-scale gold mining

Artisanal small-scale gold mining (ASM), largely practised in Asia, South America and Africa, contributes significantly to mercury emissions, both in the developing world and globally. A recent study investigates an alternative to using mercury in ASM.

The EU Mercury Strategy¹ recognises the need for global action to reduce mercury in the environment. This includes actions to help other countries reduce their mercury use and support of the UN Environment Programme mercury programme. In ASM practice, gold is often extracted by amalgamating ('blending') it with mercury. However, it is estimated that 30 per cent of the mercury used in the process is lost to the atmosphere. Furthermore, amalgamation is inefficient and recovers less than 30 per cent of the gold.

Most artisanal miners come from extremely poor backgrounds and turn to mining to escape poverty. They cannot afford to process gold themselves and so take the ore to processing centres. These centres use amalgamation - the cheapest but least efficient process. In return miners leave their tailings (residue) and the centres extract any remaining gold by cyanidation. In this process, cyanide dissolves both gold and any residual mercury, forming mercury cyanide. Mercury cyanide easily turns into methylmercury, a highly toxic mercury compound that readily makes its way into rivers and consequently fish consumed by humans.

Although cyanidation of tailings is environmentally unsound, cyanidation of the gold ore itself may be a better alternative to amalgamation. This is done by grinding the gold in cyanide, known as 'mill-leaching'.

The researchers examined the potential of mill-leaching with cyanide in a laboratory test with an Indonesian ore sample and in a field test in Ecuador. In the laboratory test, mill-leaching extracted 93 per cent of the gold in six hours. This was better than other procedures, such as magnetic methods, which recovered just 8 per cent. In the field test in Ecuador, a traditional mill-leaching technique using a mill called a "chanchas" recovered 95 per cent of gold after eight hours.

The results indicate that mill-leaching with cyanide is a superior technique to amalgamation, both in terms of its efficiency and its reduced environmental risk. It is simple, inexpensive and well-accepted by local miners. However, processing centres may be reluctant to adopt it because they have already invested in cyanidation tanks to extract gold from tailings.

The authors recommend further analysis of the socio-economic and environmental impacts of mill-leaching with cyanide. Cyanide is also toxic and miners must be educated to understand the associated risks if this process is introduced.

1. See http://ec.europa.eu/environment/chemicals/mercury
2. See http://www.chem.unep.ch/MERCURY/


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