

# In-situ leach mining

In-situ leach mining has the advantages of being able to recover minerals without rock mining operations and subsequent mineral extraction processes, with all the deleterious environmental impacts associated with such activities.

Methods used to date comprise the selective pumping of a leach-liquor into a porous or hydrofractured ore body and subsequent recovery by circumferential wells to create a solution of solubilised mineral in the extracted ground water. The processing of this solution by conventional chemical technology can require not only significant energy and chemical usage but also lead to the production of corresponding secondary wastes as well as the re-introduction of contaminants into the groundwater.

By using electrochemical processes integrated with the extraction process, wastes can be minimised and the leach solution regenerated with minimal environmental detriment.

## How it works

This process is concerned with the integrated selective electrowinning at the anodes (e.g. of Pb as  $\text{PbO}_2$  and Mn as  $\text{MnO}_2$ ) and at the cathodes (e.g. Zn as  $\text{ZnO}$ ) of valuable materials recovered by In-situ leach mining under conditions of controlled potential pH and chemical composition. These products that are spalled off the electrodes can be recovered continuously by a hydrocyclone or filter. This overall process can be coupled with the selectivity of primary extraction from the leach liquor by for example Solvent Extraction. As part of these recovery steps, oxygen or hydrogen peroxide co-products can be used to regenerate the leach liquor, without the need for the separate importation of chemical reagents. The single step recovery of pure material reduces the cost of subsequent refining and hence enhances the value of the product.

## Benefits

The benefits of the process are:-

1. Minimal chemical addition to achieve recovery of value.
  - a) minimise secondary waste
  - b) reduce reagent costs
2. Use of applied voltage control
  - a) enables mild operating conditions
  - b) can track variations in feed composition
  - c) remote and automatic plant control
3. Compact and modular plant

# Markets

The primary market of the patent has application in solution mining, value recovery from mine tailings and metal refining.

# Patents available

GB 2371810B US2002079234 CA2364953  Filed 2001	<b>Electrochemical Processing.</b> The patent describes the electrolytic recovery of value from solution mine leaching solutions – including specifically lead and manganese as dioxides and Zn as a hydrous oxide. In addition, the co-generation of hydrogen peroxide used as the selective oxidant in the leach liquor, and Calcium Carbonate recovery are claimed. The overall process flowsheet comprises a number of electrolytic and electrodialytic stages coupled with other technologies – such as solvent extraction, ion exchange, photochemistry and solid/liquid separation.
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