# Optimization of the BioScorodite process for safe Arsenic disposal

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## Motivation

Arsenic is a major contaminant in the non-ferrous metallurgical industry and treatment of arsenic-rich wastewaters is one of the most important environmental issues for the mining and metallurgical industries. Arsenic in metallurgical waste streams originate in particular from complex ores that are mined for copper, lead, zinc, cobalt, gold and silver. The demand for these metals has grown dramatically in the past years, creating a surplus of arsenic.
The immobilization of Arsenic as the very stable mineral Scorodite ($FeAsO_4 \cdot 2H_2O$) is the preferred route to safe long-term storage.

## Technological Principle:

In the BIOSCORODITE PROCESS a new biological process concept, the principle of biocrystallisation is introduced. In this process scorodite is crystallized with the aid of arsenite and ferrous ($Fe^{2+}$) oxidizing bacteria.
Previous investigations showed that scorodite crystallization can be controlled by iron-oxidizing bacteria growing at pH 1.3 and a temperature of 75-80°C in the presence of arsenate ($AsO_4^{3-}$).
However, in many relevant waste streams arsenic is present as arsenite ($AsO_3^{3}$), which remains in solution at the pH of less than 1.3 required for scorodite formation from arsenate and ferric. Biological arsenite oxidation is still a challenge, as is the conditions for crystallizing the most stable BioScorodite

## Research challenges

- Find a suitable thermoacidophile culture for arsenic oxidation and study the kinetic of biological Arsenite oxidation at pH 1.5.
- Effect of conditions pH/Temperature on the cristallynity and stability of scorodite formed from biologically oxidized arsenite and iron ferrous.
- Optimize the operational window of an airlift reactor to generate bioscorodite from As(III) and Fe(II) including the treatment of high concentrated arsenic streams.

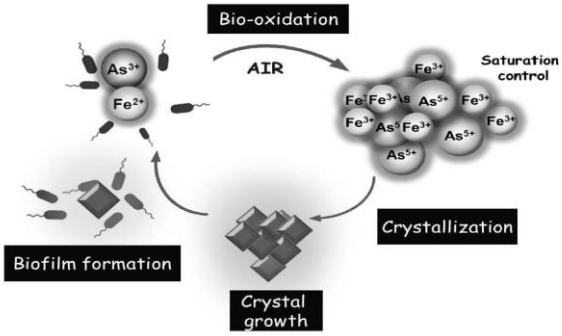


Fig1. Theoretical concept of BioScorodite crystallization

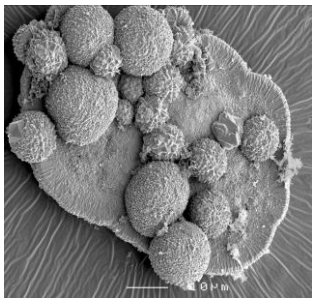

Fig 2. SEM picture BioScorodite


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