

LEACHING OF SYNTHETIC GaAs- AND INDIUM-BEARING SPHALERITE ORE WITH HELP OF “REICHE ZECHÉ” MINE WATER

Danylo Lysenko¹, Vadym Pecherskyi¹, Fabian Giebner² and Michael Schlömann²

¹*State Higher Educational Institution “National Mining University”, Dnipro, Ukraine*

²*TU Bergakademie Freiberg, Institute for Biosciences, Biology/Ecology Unit, Freiberg, Germany
lysenkodanil@gmail.com*

The main goal of the experiment was to leach minerals using microbes. To accomplish this goal, the course dealt with the acquisition of adequate bacteria, by taking water samples in the underground mine “Reiche Zeche”. Later leaching in stirred tank reactors was performed with two different substrates: synthetic GaAs and indium-bearing sphalerite ore. The leaching experiment was continuously monitored by the evolution of pH and redox potential. Samples were taken regularly in order to allow an evaluation of the actual leaching performance. The aim of the sampling part of the experiment was to establish a base for the following experiments. It was necessary to get some cultures likely able to leach sulfidic minerals. At the sampling points the pH and the redox potential were measured. In total, four samples were taken from several points. During sampling our group visited different location points in “Reiche Zeche” Mine. The Acid Mine Water (AMW) sample points were selected due to colour and measured pH of the water; aiming at the highest acidity. The common feature for all sample locations was dark brown colored water with a pH ranging between 2,4 and 3,3.

The taken samples were pre-cultivated and finally used for a leaching in stirred tank reactors with both GaAs and sphalerite for 15 days. Samples were taken regularly and pH and redox potential were measured; furthermore the concentrations of As, In, Zn, and Ga of the taken samples were measured by ICP-MS. The concentrations of arsenic and gallium were shown to increase until the addition of citric acid in all bioreactors; afterwards only the arsenic concentration kept on increasing.

To conclude the experiment, GaAs was leached quite fast and easily, if the cultures were growing actively. Nevertheless indium was not detectable, probably due to a too low In concentration in the ore material. It can also be inferred that the culture had advantages in changing conditions and the range of operation was wider than that of a pure culture because mixed culture can cover more pH conditions than pure cultures.

Key words: Synthetic GaAs and Indium Bearing Sphalerite Ore; Mixed Culture