

## Electrocoagulation as a method to treat high metal content in acid mine drainage

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### Abstract

Cyprus has a long standing history of mineral exploitation, especially with copper, a metal derived from its rich sulfide deposits exploited for 4000 years now [1]. The island was perhaps one of the earliest producers of copper derived by the smelting of sulfides [2]. The Cyprus sulfide deposits were largely mined by open-pit methods; though there were also underground workings. Most of the open pits worked in past mining years have been abandoned and rain water has filled some of the craters. The environmental problem of Acid Mine Drainage (AMD) is created by the presence of pyrite ore which was brought to the surface by the mining activities [3]. Water contaminated with heavy metals is a serious issue which has a toxic impact on the environment and on human health [4]. The present research study investigated the efficiency of electrocoagulation (EC) process on the removal of heavy metals from AMD samples from an abandoned open-cast mine.

AMD samples were collected from North Mathiatis mine, located between the villages of Agia Varvara and Mathiatis in Nicosia district, which is a typical example of an abandoned open-pit sulfide mine out of many in Cyprus. The EC studies were performed in batch mode experiments using vertically positioned aluminum electrodes (anode and cathode) in a 0.5 L reactor connected to a single channel DC power supply (0-30 V and 0-5 A). Three commercially obtained aluminum plates of size 10 cm x 5 cm x 0.3 cm immersed in a 4 cm depth with an effective area of 20 cm<sup>2</sup> each were used as electrodes in the experiments. After each treatment, samples were analysed through ICP-MS for measuring the % removal of the respective pollutants.

The results showed ~100% removal of specific metals was achieved: Fe (5 min) > Cu (45 min) > Zn (90 min) > Cd and Mn (150 min). The total S and SO<sub>4</sub><sup>2-</sup> concentrations were decreased. EC process enabled the removal of Boron. Aluminium electrodes can be effectively used for the removal of metals via EC process.

## **References**

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