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TOXIC HEAVY METALS IN THE CLAY MINERALS OF FLOTATION WASTE DUMP OF GYÖNGYÖSOROSZI, NORTHEASTERN PART OF HUNGARY

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Waste of mining may damage the environment seriously. Rainwater flowing through the waste impoundment with the oxygen from the air oxidises the sulphide minerals of the waste. One of the most reactive components is pyrite (FeS_2), which is the most common ore mineral in the mining wastes. Low pH solutions produced may dissolve other less reactive solid-state minerals. Therefore, the heavy metal content of the acidic solutions may become toxic (Jambor et al., 2000).

These kinds of solutions may be treated in many ways. The pH of the acidic solution can be raised adding lime. Therefore, the toxic heavy metal ions can be precipitated. The effluent solution or the leachate flowing into the groundwater can be stripped by flowing through a reactive barrier. The other way of the treatment is to prevent the oxidation process or to isolate the waste from atmospheric oxygen in the air and water. To reach this aim the upper few cm of the impoundment must be compressed or covered by impermeable clayey layers. Using the metal retention capability of the clay minerals, the environment may also be protected from the toxic heavy metal containing effluents (Hermanns Stengele and Plötze, 2000).

Gyöngyösoroszi is situated in the northeastern part of Hungary, in the Mátra Mountains. The flotation waste impoundment is found upstream of the village. The Gyöngyös Ore Mining Company was established in 1952. The exploited ore was processed on the spot by flotation. After the separation of the lead, copper, zinc and pyrite concentrate, the remaining pyrite-rich tailing was transported by pipeline to the tailing pond. At the end of the 1970s the operation of the mine became unprofitable, and it was closed in 1986 (Fügedi et al.) without properly decomissioning the underground and surface mine facilities, among others the tailing pond.

The environmental hazard of the waste impoundment depends on the mineral assemblages of the waste, the state of the oxidation process of the sulphide minerals. The type and grade of the environmental hazard determines the applicable treatment possibilities.

In this study, the different kinds of clay mineral assemblages of the waste were examined. The metal content of these clay minerals was studied in order to define how to decrease the environmental risk of acid rock drainage. By XRD examinations, montmorillonite, illite-montmorillonite mixed structure minerals, illite, and chlorite were found in the waste material. The contained metals in the clay minerals were determined by EDAX methods.

References

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