CLINOPTILOLITE TREATMENT OF AMD WATERS FROM AFRICA RESERVOIR IN THE ŁUK MUŻAKOWA, W POLAND

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The Muskau Arc is a large horseshoe-shaped glaciotectonic belt formed during the Mid Polish Glaciation. Neogene lignite deposits containing pyrite were excavated there till the 80-ties of the 20th century. The abandoned mining pits filled up with water forming set of reservoirs called "anthropogenic Lakeland". Oxidation of sulfide-containing lignite, exposed to atmospheric oxygen and water leads to formation of acidic waters. The waters are characterized by relatively high Fe and SO_4 content. This chemical association and acidic pH of water constitutes main environmental problem in this region, which is typical for every AMD areas.

The objective of this study is effectiveness of neutralization abilities of treatments potentially applied to large reservoir called Africa (Fot). This is a meromictic lake with permanent stratification: the mixolimnion at the top (down to ca. 12 m depth), in which the water is well mixed and saturated with oxygen, and the monimolimnion in the deeper part, which is poor in oxygen and which did not mix with upper layer. The pH and concentration of major ions is strongly controlled by the stratification with lower pH = 2.5 and lower ion concentrations in the upper layer and higher pH = 4.5 and higher salinity in the bottom one.

We tested application natural zeolite as the treatment for improvement of the quality of lake waters. The zeolite used in this study is a clinoptilolite separated from Winston clay from New Mexico (HAGGERTY & BOWMAN, 1994). In the set of bench-top experiments zeolite was added to the water pumped from the depth of 6 m and 16 m (upper and lower layer). The amount of the zeolite was calculated based on the salinity and cation exchange capacity of the sorbent.

The treatment resulted in decrease in salinity, increase of pH and precipitation of various secondary phases. The major mineral component of the precipitate was gypsum. The effects of the precipitates on hydrochemical equilibrium of the waters are modeled using PHREEQC hydrochemical model.

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Reference

HAGGERTY, G.M. & BOWMAN R.S. (1994): Environmental Science & Technology, 28(3): 452–458.