Evaluation of the long-term sulphate release from dewatered Zn-Pb ore bearing Triassic rocks in the Olkusz district (S Poland)

M. CZOP[1], J. MOTYKA[2] AND B. SYPOSZ-LUCZAK[3]

[1, 2]AGH-University of Science and Technology, Faculty of Mining and Geoengineering; [1] mariucz@agh.edu.pl, [2] motyka@agh.edu.pl;

[3] Polish Academy of Sciences, Mineral and Energy Economy Institute; bluczak@min-pan.krakow.pl;

Extensive Zn-Pb mining in the Olkusz ore district resulted in an significant contamination of dewatered Triassic rocks by secondary sulphate minerals, mainly epsomite, hexahydrite and melanterite. These precipitates generated by the oxidation of marcasite play an important role in the contamination of the groundwater in the vicinity of the Zn-Pb mines in Olkusz ore district. Nevertheless the mine water from dewatering system presently is used for water-supply purposes. It's evident that flooding of the Zn-Pb mines would be connected with significant groundwater quality deterioration due to dissolution of the secondary sulphate minerals.

Combination of static and kinetic leaching tests was developed for the assessment of long-term sulphate release from Triassic rock samples collected in the Zn-Pb mines.

Sequential static tests (with L/S=5) were used for evaluation of the available quantity of the water-soluble sulphate from each stratigraphic unit within Triassic stage. Large majority of samples was leached 3-5 times with decrease of the SO_4 in the last eluates to about 50 mg/l.

Highest amounts of the water-soluble sulphate were determined within ore-bearing dolomites, geometric means 5,1 g/kg in samples from "Olkusz" mine and 16,3 g/kg for "Pomorzany" mine. Remaining stratigrapic units: limestone and residuum material contains only about 0,6-1,6 g/kg of the sulphate.

Kinetic tests were performed under upward flow conditions for representative models of the Triassic ground for both mines. Each column tests was run for about 30 kg rock's sample with 300 pore volumes and average flow rate about 1 m/d. The initial feeds contained respectively 3,500 mg/l SO_4 for "Olkusz" mine and 25,000 mg/l for "Pomorzany" mine. After "first flush" period rapid reduction of the SO_4 concentrations was observed to about 220 mg/l for "Olkusz" mine and about 1,000 mg/l for "Pomorzany" mine. Significant decrease of the SO_4 was connected with about 10-15 pore volumes removal. It was a beginning for relatively very slow falling of the SO_4 to about 150-200 mg/l. Despite of long-term leaching only about 75-80% of the sulphate was removed from tested Triassic rocks samples.

The work was with support from research programme no. KBN 4T12A 02727.