Geochemical evolution of the groundwater from Permian molasses in "Pomorzany" Zn-Pb mine (Olkusz ore district, S Poland)

J. MOTYKA[1] AND M. CZOP[2]

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

"Pomorzany" mine is located in the Olkusz ore district with Mississippi Valley Type Zn-Pb ore hosted by Middle and Lower Triassic carbonates mainly dolomites. The Zn-Pb ore-bearing formation is also a very productive karst-fissured-porous aquifer. The Triassic aquifer is underlying by semi-permeable Permian molasses (conglomerates).

Underground workings in the "Pomorzany" mine are made both in Triassic and Permian rocks. Length of the mine galleries within Permian rocks attained about 6 km and near 70 water inflows from molasses was registered. A large majority of this inflows was periodical and only a few inflows exist presently.

Hydrochemical stratification was observed within Permian aquitard and TDS of water samples was depended on the distance from the Triassic rocks bottom. In shallow zone, groundwater was slightly mineralised and TDS range from 400 mg/l to 600 mg/l. In this zone dominance of the HCO_3 ion was evident also with relatively high concentration of Mg and Na. Shallow Permian water types were quite different but mainly Ca-Mg-HCO_3, Na-Mg-HCO_3, Na-Mg-HCO_3-SO_4 or Mg-Na-Ca-HCO_3-SO_4. In deeper zone of the Permian aquitard the TDS of the groundwater increased from 1,000 mg/l to about 22,000 mg/l and also water types were continuously changed from Na-Mg-Ca-Cl-SO_4-HCO_3 by Na-Mg-Ca-Cl-SO_4 to Na-Cl finally.

During about 35-years exploitation period of the "Pomorzany" mine significant evolution of the water chemistry from Permian molasses was observed. Hydrochemical changes occurred according to two different scenarios:

1) freshening of the Permian groundwater by descending Triassic groundwater of the Ca-Mg-HCO_3 type; connected in initial stage with decreasing both Cl and SO_4 ions and increase of the HCO_3 concentration;
2) admixture to Permian groundwater of the high sulphate Triassic groundwater formed in iron sulphides oxidation process.; much more important in long time perspective.

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