ABSTRACT BOOK

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MINE WATER GEOCHEMISTRY AND METAL FLUX IN A MAJOR HISTORIC PB-ZN-F OREFIELD

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Recent studies have shown up to 6% of rivers in England and Wales to be impacted by discharges from abandoned metal mines. Despite the large extent of impacts, there are still many areas where mine water impact assessments are limited by data availability. This study provides an overview of water quality, trace element composition and flux arising from one such area; the Yorkshire Pennine Orefield in the UK. Mine drainage waters across the orefield are charectrised by Ca–HCO_3–SO_4 type waters, with moderate mineralization (specific electrical conductance: 160 to 514 µS cm^{-1}) and enrichment of dissolved Zn (≤2003 µg L^{-1}), Ba (≤971 µg L^{-1}), Pb (≤183 µg L^{-1}) and Cd (≤12 µg L^{-1}). The major ion composition of the waters reflects the Carboniferous gritstone and limestone-dominated country rock, the latter of which is heavily karstified in parts of the orefield, while sulphate and trace element enrichment is a product of the oxidation of sphalerite, galena and barite mineralization in particular. Many of the discharges and receiving streams are close to saturation, or supersaturated with respect to calcite, with secondary instream carbonates and biofilms likely to be crucial in controlling downstream mobility of divalent metals. The overall flux of metals released from 26 monitored adit discharges is estimated from baseflow measurements to be in the region of 2890kg Zn $year^{-1}$, 160kg Pb $year^{-1}$ and 16kg Cd $year^{-1}$. These figures are put in context with national inventories of metal release and the impacts of the discharges are assessed with regard to the physico-chemical nature of receiving watercourses.

Keywords: *mine water; zinc; lead; cadmium; pollution;*

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HYDROCHEMICAL CHARACTERISTICS OF MINE WATERS FROM ABANDONED MINES IN SERBIA AND THEIR IMPACT ON THE ENVIRONMENT

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Research and exploitation of gold, bismuth, wolfram, copper, zinc, lead, coal and uranium deposits were very intense in Serbia. Upon completion of the research and exploitation of mineral resources, many mining sites were abandoned, without previous establishing environmental protection measures, from which mine waters have been discharged uncontrollably in surface flows. Research on wide area were conducted to determine the chemical characteristics of mine waters from abandoned mines of various types of ore deposits.

Based on conducted research it was concluded that in cation composition predominates Ca^{2+}, while the most common anions are SO_4^{2-} and HCO_3^-. Statistical analysis of 20 selected samples showed strong correlations between pH value and content of metals (Fe, Mn, Zn, Cu) in mine waters, whereby with decrease of pH value concentrations of these metals increase. Cluster analysis was applied on all analyzed parameters and, as a result, four groups of mine waters were separated. Mine waters were also classified on the basis of parameters that in high concentrations can have harmful effects on the environment (pH, TDS, SO_4^{2-}, Fe, Mn, Zn, Cu, As, Ni). With this approach, in a separate group were abstracted mine waters related to Cu and Pb-Zn deposits, whose composition is the result of AMD (*Acid Mine Drainage*). According to their chemical composition, they are sulfate waters with increased concentrations of total iron, manganese, copper, zinc, arsenic, and other metals. Uncontrolled discharge of these waters directly into surface waters leads to degradation of quality of the latter, which is further influenced by old mine tailings, in which low grade ores are deposited.

Keywords: *water chemistry; environmental chemistry; acidity;*