

METAL SPECIATION IN RIVER BED SEDIMENTS WITHIN THE POLISH PART OF MUSKAU ARCH GEOPARK

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Abstract: The object of the investigation was metal contamination of bottom sediments of the Skroda and Chwaliszówka rivers, which are the right tributaries of the Lusatian Neisse river, draining the territory of the so called “anthropogenic lake district”. The district came into existence as a result of mining activities in the border of Silesia and Lusatia, which date from the half of 19th century to 1974. The district includes about 100 reservoirs, of the total area of over 150 ha, which are from about 30 to 100 years old.

The rocks accompanying the Miocene coal-bearing formations were deposited on waste dumps. The dumps form embankments of the aquifers arising as a result of post-exploitation mining subsidence. The streams dewatering waste dumps inflow directly or indirectly to the Chwaliszówka and Skroda rivers. The pyrite is the mineral present in mine waste material. The pyrite weathering products inflow into surface waters and affect adversely the water quality. In the last stage of migration the pollutants are accumulated in the bottom sediments of rivers and lakes.

The samples of bottom sediments of the two rivers were analysed by means of a five-step sequential extraction procedure performed for the partitioning of selected trace metals (Fe, Mn, As, Cr and Al). It was determined that the bottom sediments of the two analysed rivers contain significant concentrations of aluminium and iron. The concentrations of other metals (Mn, Cr and As) are in the range of geochemical background of water sediments in Poland.

Concentrations of arsenium, chromium and manganese, which are bound to easy-available fractions (I – exchangeable and II – bound to carbonates) are not significant, so it could be assumed that they are not expected to be released and they do not threaten the river ecological system. There is, however, the possibility of the aluminium and iron re-mobilisation, taking into account the high concentrations of easy-available fractions of these metals in the sediment. Fe and Al are potential source of water contamination, and re-mobilisation of these metals will produce the aggravation of quality parameters of river waters.