

Authigenic, bacterial heavy metal sulphides and oxysulphides polluting Przemsza river sediments, Zn-Pb and black coal mining area, Poland

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Heavy fraction derived from sediments of the polluted Przemsza river constitutes from 3.54 to 6.71% of the sediments investigated.

Heavy fraction is composed of:

I) mm to sub-millimeter fragments of rust made up from hydrated Fe oxides (limonite, hematite, magnetite, wüstite) derived from decaying machinery in mines, electric power plants, smelter mills, and ash particles of various provenance including fly ash, ash and slag from smelters, and ash dumped from homesteads. The above mentioned compounds constitute more than half of the heavy fraction studied (50- 70%)

II) authigenic heavy metal sulphides are represented mainly by framboidal pyrite, bacterial mats growing on metal pieces and coal particles. Bacterial mats contain framboidal Fe-Zn oxysulphides, chalcopyrite-like and bornite-like oxysulphides. The last two minerals are banded and grow from Cu-sulphate added as activator of Zn and Pb sulphides flotation in flotation plants

III) metal sulphides like pyrite, Ni-pyrite, chalcopyrite, sphalerite and galena or anglesite. The last two are angular and are coming from flotation mills as a fine particulate matter,

IV) black coal particles and associated coal shales and sandstones with size from a few mm up 2.5cm, and a few to 0.1mm particles of unburned anthracite are abundant components of the river sediments. They may be coated on the surface by bacterial mats. Several superimposed bacterial mats or framboidal pyrite may overgrow one over another.

Bacterially derived sulphides and oxysulphides are main agents controlling abundance of heavy metals (except of Pb present mainly as fine PbS or PbSO₄ particles) in the polluted Przemsza river sediments. Framboidal magnetite occurs in the same samples as framboidal pyrite. It forms separate clots of euhedral grains with size of individual euhedrons in order of 0.5µm.