

Mineralogy and chemistry of ochre sediments from eastern part of the Outer Carpathians

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The subject of this work is the accumulation of ochre sediments in Zabratówka village located about 20 km south-east from Rzeszów (SE Poland). The area is situated in the eastern part of the Outer Carpathians, within the Dynów Piedmont which is built of the Skole unit formations (flysch sediments of the Lower Cretaceous-Lower Miocene age).

Ochre sediments have been investigated using X-ray diffraction (XRD), thermal methods (DTA, TG, DTG), scanning electron microscopy observations with chemical analyses in microarea (SEM-EDS), Mössbauer spectroscopy and chemical methods (XRF, AAS, ICP-MS, selective extractions) in order to determine their mineralogical and chemical composition.

The content of iron in the ochre sediments range from 30.80 to 43.58 wt.% and determine the ochre colours which varies from yellow through different shades of red to brown.

Results of the diffractometric analysis indicate that goethite is a dominant iron mineral phase present in the ochre. It is characterized by a weak structural reorganization and is accompanied by small amounts of quartz and alkali feldspars.

The ochre sediments lost between 15 and 22% weight when heated to 1000°C and also the low dehydroxylation temperatures (~280°C) may suggest a small particle size and poorly crystalline goethite structure. The weight lost after the dehydroxylation of this mineral (diagnostic endotherm reflex around 270-350°C) is due to the presence of organic substance.

Mössbauer spectroscopy confirm that goethite is a dominant iron mineral phase present in the ochre (up to 85% of Fe compounds in the studied samples with parameters IS = 0.33-0.44 mm/s and QS = 0.61-0.73 mm/s). Moreover, the results of Mössbauer analysis may suggest the presence of jarosite with typical parameters IS = 0.33-0.46 mm/s and QS = 1.06-1.16 mm/s.

On the basis of the studies conducted a conclusion can be made that goethite is the major mineral in the ochre sediments. The presence of small amounts of jarosite is possible as well. There is no clear evidence of the presence of schwertmannite.