# FERRUGINOUS CONCENTRATIONS IN SANDSTONES NEAR DOBCZYCE (SILESIAN UNIT, THE WESTERN POLISH CARPATHIANS) – PRELIMINARY RESULTS

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The Istebna Beds that build the northern edge of the Dobczyce retention reservoir on the Raba River near Brzączowice (*ca*. 30 km SE of Kraków) contain layers and beds enriched in Fe compounds. They are rusty or yellowish, in some places become distinctly black. Within these iron-rich horizons, there occur characteristic, boxwork-like goethite concretions.

Mineral composition of these ferruginous concentrations with special attention to the boxwork-like concentrations, whose origin is still a matter of discussions, was investigated using transmitted light microscopy, X-ray diffractometry (XRD) and scanning electron microscopy (SEM-EDS). The authors also determined the contents of Fe and Mn; the figures cited below refer to the HCl-soluble Fe.

Five types of Fe-rich concentrations that differ in their mode of occurrence, Fe content and mineral composition have been distinguished on the basis of hand specimen features and preliminary mineralogical investigations:

1) sandstones cemented (uniformly or non-uniformly) with Fe oxyhydroxides (especially goethite), with colours from yellow to almost black, containing dozen or so wt% Fe;
2) goethite incrustations on the surfaces of sandstones, containing up to *ca*. 30 wt% Fe;
3) boxwork-like concretions proper, composed almost of pure goethite and containing up to 87 wt% Fe;
4) sulphate-oxide concentrations, that are composed of jarosite, goethite and detrital material and contain up to 53 wt% Fe. Similar concentrations with secretion-like features were described by GUCWA & WIESER (1976);
5) phosphate-oxide aggregates that are mainly composed of apatite, quartz, Fe and Mn oxides and contain up to 12 wt% Fe.

The main Fe mineral is usually cryptocrystalline goethite, but it may also form characteristic, fan-shaped aggregates of elongated crystals, lining the walls of pores and fractures. Mn oxides are present in all types of ferruginous concentrations, either dispersed or in the form of incrustations, irregular concentrations, veins and dendrites.

On the basis of these preliminary investigations, the origin of the Fe concentrations studied may be related to weathering under oxidizing conditions of primary, Fe-bearing minerals (silicates, sulphides and, possibly, carbonates) that must have been present in surrounding rocks. Goethite, the main Fe component of these aggregates, can be formed in different weathering environments characterized by a wide spectrum of physicochemical conditions (pH, Eh, foreign ions; CORNELL & SCHWERTMANN, 1996). Variations of these parameters may have controlled the forms of occurrence and the degree of crystallinity of goethite. Its presence in different forms indicates several stages and/or mechanisms of weathering, various Fe sources, etc. The boxwork-like structures resulted probably from precipitation of goethite from the solutions that penetrated cracks in sandstones and progressively replaced the primary rock with the iron oxyhydroxide (RUKHIN, 1953). In sulphate secretions goethite is probably a final product of co-existing jarosite transformation. Jarosite crystallizes from acid solutions with pH < 3 that are rich in sulphates and $Fe^{3+}$ (DUTRIZAC & JAMBOR, 2000) and its presence strongly implies weathering of sulphides.

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