

IRON ACCUMULATION IN WETLANDS: FORMS AND PROPERTIES

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In wetlands, with shallow and fluctuating groundwater level, the conditions are favourable for precipitation of iron compounds. Due to oscillating redox conditions, the precipitating iron compounds may attain different forms. One of such forms is the bog ore. It occurs at depths of ca. 20cm and most commonly forms a 15 to 30cm-thick horizon. In Poland, bog ores cover an area of ca. 18000km². The investigations aimed at describing the bog ores on the basis of their chemical, mineralogical and micromorphological properties were carried out in the Vistula River valley in the vicinity of Warsaw. A total of 20 soil profiles were analysed. The basic chemical properties (pH, pedogenic iron content, total chemical composition, mineralogical composition and micromorphological features were determined. Based on the data obtained from macro- as well as microscopic investigations, three different types of bog ores were distinguished, differing in their chemical properties as well as mineralogical composition and micromorphological structure. Type A represents bog ore occurring as a uniform massive horizon containing ca. 50% Fe, 3% P and 1% Mn. The main iron mineral in type A was ferrihydrite $5\text{Fe}_2\text{O}_3 \cdot 9\text{H}_2\text{O}$. Analyses of the matrix show that it comprises mainly iron hydroxides and very few open pores, canals and cracks. Type B is bog ore in form of concretions up to 0.5 cm in diameter. The content of iron compounds is ca. 50%, and the content of phosphorus compounds was slightly higher in comparison with type A and reached ca. 4%. The main iron compound was goethite $\alpha\text{-FeOOH}$. Micromorphological analyses have shown that all these minerals can co-occur, what testifies for continuous oscillations of the redox conditions. Type C represents soft bog iron ore with higher contents of organic carbon. Fe content in this type is about 50 weight %. Phosphorous, with 8 weight %, is most abundant of all three types. Additionally to iron oxides, such as goethite and ferrihydrite, Fe minerals, such as vivianite and siderite occurs in this type as well. All minerals are mixed in a horizon (micromorphological evidence), which means changing redox conditions during a year or soil development, respectively.