

Summary

The PhD thesis deals with arsenic speciation under reducing conditions of soil with elevated content of organic matter. This issue has been studied in two wetland soils located in two geochemical As anomalies near the villages of Mokrsko and Smolotely (CZ). Speciation and mobility of As was studied in four experiments using a range of mineralogical (XRD, SEM/EDS, EMPA, Raman microspectroscopy) and geochemical (XRF, chemical extraction, pore water analysis) methods. Other methods used in this work included S isotopes and microbial community analysis. The results indicate that the formation of authigenic As sulfides (realgar and bonazziite) is a relatively common mechanism of As sequestration in reducing conditions of wetland soils. The sulfides are formed in highly reducing organic-rich microenvironments, where microbial production of dissolved sulfide is sufficiently fast compared to water flow velocity and related slow solute transport. In these microenvironments, Fe sulfides are the first precipitates; As sulfides precipitate after the depletion of Fe^{2+} in the pore solutions. This phenomenon was well evidenced in the long-term incubation experiment. Results of this experiment also showed that newly formed As sulfides can form in environments with variable concentrations of As and Fe in groundwater. Low reactivity of authigenic As sulfides under oxic conditions in combination with our previous findings indicate that precipitation of authigenic As sulfides is a promising remediation mechanism that can potentially be used in the constructed wetlands.