

SUMMARY

Mining wastes may cause major environmental problems in many spheres of the environment: soil, water, air and biota because wastes usually contain a high levels of toxic elements including arsenic (As). In this work we have used a combination of geochemical (mineralization and ICP analysis, selective chemical extraction) and mineralogical (X-ray diffraction analysis, scanning electron microscopy and microprobe, Raman microspectroscopy) methods to determine the distribution and speciation of As in soils and mining waste material in the Smolotely-Líšnice ore district that hasn't been studied yet. We found that As content in the mining wastes and soils achieve very high concentrations (up to 20 000 mg.kg⁻¹ in soil and 9 000 mg.kg⁻¹ in mining waste) with the highest levels found in the naturally developed soil of agricultural area. The concentrations of other potentially toxic elements were negligible. Arsenic distribution along the soil profiles indicates natural origin of As contamination developed from weathering of the bedrock.

Mineralogical methods showed that As occurs in several secondary forms: arsenates (arseniosiderite, bariofarmakosiderite and yukonite) and hydrated oxides of trivalent iron (HFO) (ferrihydrite, goethite and hematite). The precursor of these phases is arsenopyrite that forms rare relicts embedded in the secondary arsenates. Comprehensive evaluation of the mineralogical methods allowed to design the formation sequence of the secondary minerals, which shows that the initial phase of arsenopyrite oxidation was bariofarmakosiderite or yukonite. Both of these phases are not stable under given conditions and are transformed into arseniosiderite, a stable phase in the studied samples. Using the selective extraction, we have found increased mobility of As in the reducing conditions of the gley soils.