Potential mobility of Cr from heavily contaminated soil

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Abstract

Soil on the territory of Buzuluk Komárov, Czech Republic, contains elevated level of chromium. This study focuses on assessing the leaching potential of this potentially toxic element (PTE). It identifies the “near total”, available and leached out content of chromium and main factors affecting its mobility.

At first, basic soil properties (pH, CEC, mineralogy, organic carbon content) were determined. Two leaching experiments (batch and column) were performed in order to determine the effects that deionized water as well as citric and oxalic acids have on the dissolution of chromium from soil. Ion chromatography was used to determine the ions present in the leachates from citric and oxalic acids. Four step sequential extraction (BCR) procedure was carried out to obtain information on fractional distribution of this element in sampled soil. The investigation of soil samples showed high 2M HNO_3 extractable (“near total”) content of chromium but low available content. There was a slight increase in chromium content in deionized water leachates and an observed trend of overall increasing PTE concentration in both citric and oxalic acid leachates. Organic matter content and pH appeared to be important factors affecting chromium mobility. The decrease in amount of organic matter and lower pH values seem to cause more intensive leaching of this PTE from analysed soil. Deionized water showed to be the least efficient extracting agent when compared to oxalic/citric acid. Citric acid appeared to be more effective in dissolution of chromium than deionized water as evident from Kruskal – Wallis statistics. Oxalic acid also proved to have high affinity for chromium. Fractional distribution of chromium in analysed soil was significantly changed after the column leaching experiment, however, major amount still was bound to reducible and oxidizable fractions.

Dynamic condition of the solvents appeared to enhance leaching of the PTE as opposed to the static condition in batch experiment. Concentrations of chromium in leachates are exceeding water guideline values.