



Czech University of Life Sciences Prague

Faculty of Environmental Sciences

CHEMICAL STABILIZATION OF METALS/ METALLOIDS IN CONTAMINATED SOILS

Team introduction:

Chemical stabilization is a soil remediation method based on the application of various inorganic and organic amendments to contaminated soils. These stabilizing agents lower the mobility and bioavailability of risk elements in such soils. Immobilization is achieved through several physico-chemical processes, such as adsorption, complexation, precipitation and co-precipitation. Our research team studies sorption mechanisms on various amendments, mostly iron and manganese (nano-)oxides and biochar. The efficiency of the stabilizing agents is evaluated using batch, column and lysimeter experiments in the laboratory and field and modeled using geochemical and hydropedological transport models.

Team members:

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5 most significant recent publications by team members:

Komárek M., Koretsky C.M., Stephen K.J., Alessi D.S., Chrastný V. 2015. Competitive adsorption of Cd(II), Cr(VI) and Pb(II) onto nano-maghemite: A spectroscopic and modeling approach. *Environmental Science & Technology*.

Vítková M., Komárek M., Tejnecký V., Šillerová H., 2015. Interactions of nano-oxides with low-molecular-weight organic acids in a contaminated soil. *Journal of Hazardous Materials* 293, 7-14.

Trakal L., Bingöl D., Pohořelý M., Hruška M., Komárek M., 2014. Geochemical and spectroscopic investigations of Cd and Pb sorption mechanisms on contrasting biochars: Engineering implications. *Bioresource Technology* 171, 442-451.

Komárek M., Vaněk A., Ettler V., 2013. Chemical stabilization of metals and arsenic in contaminated soils using oxides - A review. *Environmental Pollution* 172, 9-22.

Trakal L., Kodešová R., Komárek M., 2013. Modelling of Cd, Cu, Pb and Zn transport in metal contaminated soil and their uptake by willow (*Salix x smithiana*) using HYDRUS-2D program. *Plant and Soil* 366, 433-451.

Applied outcomes of the research and further potential applications of the research:

Metal contamination of soils is a serious environmental problem. The development of innovative non-destructive soil remediation methods is currently under intensive research and chemical stabilization represents a gentle approach. Nano-oxides are becoming an interesting stabilizing amendment particularly owing to their high specific surface and reactivity. The development of geochemical and transport models describing contaminant behavior and migration on remediated sites is also crucial for the evaluation of remediation procedure efficiency.

Keywords: *soil contamination; chemical stabilization; nano-oxides; biochar; metals; metalloids*

