Department of Soil and Environment

Independent project/ degree project

Title: Remediation of metal contaminated soils - evaluation of long-term effects of zero-valent iron amendments

Credits: 30 credits
Level: Advanced
Subject: Soil Science/Environmental Science
Programme: Civilingenjörsprogrammet i miljö- och vattenteknik, Master program in Soil and Water management
Start: September 2012 (if possible)

Background
An importance of iron oxides for trace element geochemistry is widely acknowledged and being utilized to reduce environmental and health risks associated with contaminated soil and groundwater. Iron containing materials added to contaminated soil can sorb, complex and coprecipitate trace elements and by this reducing their mobility and toxicity. This allows applying the method on large contaminated sites as a cost-efficient alternative to expensive and disruptive excavation and landfilling.

Corrosion of metallic iron particles (zero-valent iron) added to soil produces ferrihydrite (meta-stable poorly crystalline oxyhydroxide), which reacts with dissolved trace elements (e.g. arsenic) and reduces their mobility. It is often assumed that aging of iron oxyhydroxides will occur, which would result in more crystalline Fe oxide phases such as goethite and hematite that have lower specific surface areas. However, very little experimental evidence is available on this matter.

Issues

The proposed work is part of Formas sponsored collaboration between Luleå Technical University, Swedish Geotechnical Institute and SLU. We have collected soils from four long-term European field experiments in which the soil remediation using zero-valent iron is being studied. The four soils are contaminated with:

1) Ni/Cd
2) Cu
3) As
4) Cu/Cr/As

The objective of the present work is to investigate long-term effects of zero-valent iron additions on the solubility of different metal contaminants.

Performance

1) Literature review
2) Batch experiments in which metal solubility as a function of pH is being studied.
3) Evaluating results from batch experiments using geochemical modeling (Visual MINTEQ)
4) Writing a report
5) Oral presentation of results at SLU (mandatory) and SGI (optional)

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