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Problem Description
Bachelor/Master Thesis

**Institute for Modelling
Hydraulic and Environmental
Systems (IWS)**

Research Facility for Subsurface
Remediation (VEGAS)

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Document1

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Determination of the *labile* organic carbon in soils

Organic carbon in soils is an important parameter for remediation measures of contaminated sites like in-situ chemical oxidation (ISCO) and for the soil quality in agriculturally used land. In ISCO applications the natural oxygen demand (NOD) determines the consumptions of oxidant by the soil itself, while in top soils the natural organic carbon is essential for the soil biota and the fertility.

For the characterization of top soils the total organic carbon (TOC, according to ISO 10694, Soil quality — Determination of organic and total carbon after dry combustion (elementary analysis) is used, but does not reflect the quality of the soil organic carbon (SOC). For assessing the fraction of the SOC that is available for soil biota, the so-called labile organic carbon (labile SOC), a treatment with permanganate is proposed in the literature. Unfortunately, no generally accepted method exists regarding the reaction conditions such as concentration of the permanganate solution, temperature and duration.

The objective of this thesis is developing a standardized method for the determination of the labile organic carbon also based on a previous thesis¹.

¹ Renz, Noah (2019): Entwicklung eines Schnellbestimmungsverfahrens für NOD-Gehalte von Böden bei ISCO-Anwendungen. Bachelor Thesis, University of Stuttgart.

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VEGAS-Management: Prof. Dr.-Ing. Wolfgang Nowak
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The thesis will comprise the following tasks:

- A literature review about the characterization of the organic carbon in soils.
- Adaption of the method developed by Noah Renz for labile organic carbon by optimization of the reaction conditions (concentration of permanganate solution, reaction temperature and duration).
- Characterization of a set of typical soils provided by VEGAS/RiskCom with respect to grain size distribution, TOC/TIC, (heavy) metal contents, buffer capacity.
- Application of the optimized method at the set of soils provided.
- Determination of the average oxidation number of the soils by measuring the TOC before and after treatment with permanganate.
- Comparison of existing labile SOC analytical methods (field tests) with TOC fingerprints from DIN 19539 method.
- Statistical evaluation of the outcome.

For the thesis, the analytical and personal resources of the VEGAS laboratory are available. The work shall be documented in a written thesis and defended in a 30 minutes oral presentation.

Supervisors

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Examiner

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Start of thesis:

Date of delivery: