



Versuchseinrichtung zur Grundwasser- und Altlastensanierung - VEGAS
[IWS - Universität Stuttgart - Pfaffenwaldring 61 - D-70550 Stuttgart](#)

Bachelor/Master Thesis

Universität Stuttgart
Institut für Wasserbau

Wissenschaftlicher Leiter VEGAS
Jürgen Braun, PhD Tel.: 685-67018
Technischer Leiter VEGAS
Dr.-Ing. H.-P. Koschitzky Tel.: 685-64716

Pfaffenwaldring 61
D - 70550 Stuttgart
Telefon +49 (0) 711 685 - 64717
Telefax +49 (0) 711 685 - 67020
E-Mail: jb@iws.uni-stuttgart.de
Internet: www.vegasinfo.de

Nk / 4. März 2021
TotalF_210304

Determination of the Total Organic Fluorine in Soil Samples

Per- and polyfluoroalkyl substances (PFAS) pose a considerable risk for the environment. These substances consist of a huge variety of different chemical classes of compounds with very different physico-chemical properties. PFAS have been produced since the 1940s in large quantities and only recently their environmental behavior came into focus. Since the C-F-bond is very stable and scarcely found in natural systems no microbial degradation (mineralization) occurs.

A special challenge for both the analytical strategy and the numerical modeling poses the fact that PFAS consist of a more than 4700 compounds (according to OECD), from which currently only about 20 usually are quantified in routine analysis. A number of these analytical targets are breakdown products, derived from larger (mostly unknown) precursors by microbial activity, which makes the source term undefined.

In this thesis, previous work is to be continued towards a determination of the Total Organic Fluorine as a sum parameter for characterizing the potential of fluorinated substances present in a soil sample. The idea is to extract the fluorinated compounds from the soil at elevated temperature and pressure under oxidizing and alkaline conditions (alkaline aqueous persulfate solution). Under these condition the precursor molecules are broken down to leave the fluorinated chain fragments as carbonic acids. The fluorine content of the dissolved acids is determined by combustion ion chromatography as inorganic fluoride.

The work will be based on two previous theses.

Tasks:

- Optimization of the extraction conditions (pressure, temperature, pH) and the concentration of the oxidant using synthetic precursor mixtures
- Optimization of the sample preparation procedure from natural soil samples to the final determination step
- Application of the method at real samples from a site in the Rhine valley

The problem, the approach and the results are to be presented in a concise manner in a research thesis and the results are to be defended in a presentation of approximately 30 minutes duration.

Lab staff, PhD students and technical personal as well as a CIC-System are available to assist setting up and conducting the experiments.

Problemstellung:

- Jürgen Braun, PhD
- PD Dr.-Ing. Claus Haslauer

Supervision:

- Dr.-Ing. Norbert Klaas (norbert.klaas@iws.uni-stuttgart.de)
- MSc. Thomas Bierbaum

Start: as of today