

Novel chemical methods for soil health monitoring

Summary

The project's overall goal is to examine, develop, and implement novel chemical methods and the best practices for soil health monitoring using portable analyzers and sensors supported by artificial intelligence. Implementing novel chemical methods for soil health monitoring will help farmers move toward the targets set by Green Deal. Specifically, Green Deal targets by 2030 include Farm to Fork and Biodiversity strategies, cutting nutrient losses by 50%, fertilizer reduction by 20%, chemical pesticides by 50%, and increasing the share of organic farming by at least 25%. As a result, this project will make agriculture more sustainable and precise by using smart technologies.

Research field:	Chemistry and biotechnology
Supervisor:	Prof. Dr. Jekaterina Mazina-Šinkar
Availability:	This position is available.
Offered by:	School of Science Department of Chemistry and Biotechnology
Application deadline:	Applications are accepted between June 01, 2022 00:00 and June 30, 2022 23:59 (Europe/Zurich)

Description

Soil health monitoring has recently become more and more important in the light of reducing the need for fertilization and achieving nutrient (nitrogen, potassium, and phosphorous) neutrality in agriculture. European Commission aims to see a reduction in nutrient losses of at least 50% by 2030, while ensuring no deterioration in soil fertility. This is expected to lead to a reduction in fertiliser use of at least 20%. The Common Agricultural Policy's objectives are to provide safe, healthy, and sustainably produced foods for society, protect natural resources, and enhance biodiversity.

To fulfill this goal of sustainable agriculture, there is a need for rapid chemical analysis methods for monitoring the soil health in real time, so that the farmer can decide if there is a need for fertilization to maximize the yield level or, on the contrary, to not over-fertilize the fields, ensure that the farming would be economically sustainable and reduce the harmful effects of pollution. This PhD project focuses on developing methods for portable devices to monitor soil chemical properties and to also develop reference methods to ensure the method that is used in portable devices is fit for purpose.

Responsibilities and (foreseen) tasks

- To conduct research on novel analytical methods and sensors
- To display initiative in identifying and resolving problems relating to the research
- To write research publications and present the results of the Ph.D. project at scientific conferences

Applicants should fulfill the following requirements:

- MSc in chemistry, material, or related field
- Must be a highly motivated and proactive individual with excellent communication skills
- Strong written and oral communication skills in English

The following experience is beneficial:

- Laboratory work in general
- Knowledge of good validation practices for analytical procedures
- Experience with analytical separation techniques (HPLC, CE, GC) and detection methods (absorbance, fluorescence, conductivity, etc.)
- Working knowledge of statistics



The candidate should submit a research plan for the topic, including the overall research and data collection strategy.

We offer:

- 8-year Ph.D. position (0.5 work load) in one of the largest, most internationalized, and leading life science research departments in Estonia
- The chance to do high-level research in a multidisciplinary team (chemists, IT, engineers)
- Opportunities for conference visits, research stays, and networking

About the department

The project will be conducted in cooperation with two universities, Tallinn University of Technology, School Science, Department of Chemistry and Biotechnology, Smart Analytics Research Group and Tallinn University, School of Natural Sciences and Health, supervised by Dr. Jekaterina Mazina-Šinkar (TALTECH) and co-supervised by Prof. Ruth Shimmo (Tallinn University).

The main research topic of Smart Analytics Research Group (TALTECH) is concentrated on the various portable sensors and analyzers development to detect various chemicals and biological compounds that can be implemented in biotechnology, food, environmental and medicine industries. The core technologies are capillary electrophoresis, fluorescence, conductivity, gas chromatography, microfluidics, and other instrumental and analytical techniques.

Additional information

For further information, please contact Jekaterina Mazina-Šinkar jekaterina.mazina@taltech.ee



To get more information or to apply online, visit <https://taltech.glowbase.com/positions/551> or scan the the code on the left with your smartphone.