Development of advanced analytical methods for determination of regulated and controlled substances

Summary

TalTech School of Science, Department of Chemistry and Biotechnology is offering a 4-year PhD position in chemistry.

Research field:	Chemistry and biotechnology
Supervisors:	Yevgen Karpichev Mihkel Kaljurand
Availability:	This position is available.
Offered by:	School of Science Department of Chemistry and Biotechnology
Application deadline:	Applications are accepted between November 16, 2020 00:00 and December 16, 2020 23:59 (Europe/Zurich)

Description

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Despite of technological advance and developed safety measures and restrictions, the chemical spills, disasters, and terrorist attacks continue to occur. The chemical exposures resulting from the dramatic events require immediate recognition. The fast detection of the certain type of a toxin plays pivotal role in accident management since the first seconds. Understanding which toxic industrial compound (TIC) or chemical warfare agent (CWA) have been involved in an accident is vital for appropriate response measures. A challenge is also to analyse the transformation products of toxic compounds and hazard residues after decontamination. There are gaps remaining in the existing approaches of the sample preparation, implementation of new detectors, derivatization and trace analysis of toxines' metabolites/transformation products in the environmental and biological samples. Obtaining an exposure history, providing supportive care, and obtaining and using antidotes may be lifesaving. The attempt to significantly improve sensitivity and selectivity of detection of the TIC and nerve agents or their non-toxic surrogates include, among others, capillary electrophoresis method (CE) and microfluidic digital platforms based on it. Following this demand, a portable CE system with contactless conductometric detection has recently been designed at TalTech to use for in situ analysis of the extracted sample of the toxic compounds of different structure.

The aim of this PhD project will be to develop the procedure suitable for real-life applications in the case of the emergency event at variable weather conditions (humidity, temperature, soil, etc.). The portable analysers based on CE is to be a part of the portable user-friendly all-weather and all-terrain kits for certified First Responders and spontaneous volunteers. This PhD project will be a part of project aimed at designing versatile detection methods to prevent or minimize the threat and impact of terrorist attacks and technogenic disasters.

Qualifications:
The applicants should fulfill the following requirements:

- a university degree within a related field and a good background in analytical chemistry and willing to master new techniques and methods
- good knowledge in spoken and written English
- good cooperation ability, creativity and a curious mind
- engineering mind/skills or willinnes to gain them

- readiness to perform short-term scientific mission to the collaborators’ teams abroad

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