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LABORATORY OF FLOW ANALYTICAL METHODS (SIA GROUP)

RESEARCH AREA & EXCELLENCE

Flow methods in analytical chemistry

Automation of reagent based assays, transformed from labour intensive task, into computer assisted microfluidic interface that yields desired information in real time. Flow processing is characterized by its versatility and ease of automation. Samples are processed in an enclosed tubular conduit, thus being protected from an outside environment. The flow mode is suitable to automate separations, including gas diffusion, to handle suspensions and filtration, and is compatible with a very wide range of detection techniques.

Mission

To get better knowledge of processes in flow for development and application of automatic analytical methods for fast, low-trace and operation independent analyses.

KNOW-HOW & TECHNOLOGIES

Content of Research

Automation of analytical methods using computer controlled flow manifolds for all steps of analytical procedures and detection.

Main Capabilities

Sample handling, sample pre-treatment, high-selective analysis, monitoring of long-time processes, chromatographic separation for virtually any kind of samples (matrix).

Fields of Research

Pharmaceutical, biomedical and environmental analysis. Development of flow analysis manifolds and made for purpose assays.

- Determination of pharmaceuticals and metabolites in pharmaceutical, biological and environmental saples
- Determination of active substances and additives in food supplements
- Determination of nutrients, pollutants and elements in water
- Kinetic studies of reactions and membrane transports
- Monitoring of long-term processes

EXPERTISE

Automation in analytical chemistry using micro-flow methods (FIA, SIA, SIC and in-syringe analysis). Miniaturization of analytical instrumentation using Lab-On-Valve format (SIA-LOV). Automation of extraction techniques (DV-SIA, SPE-SIA).

EXPECTATIONS & OFFERS

We are looking for cooperation with academic partners as well as public and private organizations/companies in the fields of analytical flow method development, technology of flow method instruments and applications related to/ performed with the flow methods.

KEY RESEARCH EQUIPMENT

Sequential injection systems – 7 manifolds (commercial and lab-made) – modified for long-term monitoring, sample pre-treatment, chromatography, solid-phase extraction and liquid-liquid extraction.

- 2x SIChrom™, MicroSIA, FIAlab 3500, FIAlab 3000 (all FIAlab®, USA)
- MiniSIA-2 (GlobalFIA®, USA)
- Lab-made SIA system controlled by LabVIEW® based software FaFSIA version 2.0. Detection
- Spectrophotometric, fluorescence and chemiluminescence
- Available instruments for comparison and further development
- HPLC, UHPLC, MS/MS, HR-MS, CE, ITP-CZE, voltammetric analyser

PARTNERSHIPS & COLLABORATIONS

Main Projects

- Development of automated flow methods (SIC, SIA) for use in oceanographic research.
- Development of automated methods for environmental monitoring including on-line sample pre-treatment.
- Development of chromatographic, SPE and LLE methods based on flow manifold for quality control.
- Development of methods for long-term monitoring of biotechnological processes or physiologic transport mechanisms in cells.

International collaborations

- Prof. Jaromír (Jarda) Růžička – University of Hawaii, Honolulu, USA
- Prof. Beatriz Fernandez Band, Dr. Carolina Cecilia Acebal – Department of Chemistry, Universidad Nacional del Sur, Bahia Blanca, Argentina
- Prof. Spas Kolev – School of Chemistry, University of Melbourne, Australia
- Prof. Manuel Miró – Department of Chemistry. University of Balearic Islands, Palma de Mallorca, Spain
- Prof. Maria C.B.S.M. Montenegro – Faculty of Pharmacy, University of Porto, Portugal
- Prof. Marcela A. Segundo – Faculty of Pharmacy, University of Porto, Portugal
- Prof. Victor Cerdá – Department of Chemistry. University of Balearic Islands, Palma de Mallorca, Spain
- Assoc. Prof. Andrii Vyshnikin – Faculty of Chemistry, Dnipropetrovsk National University, Ukraine

National collaborations

- Assoc. Prof. RNDr. Dagmar Solichová, Ph.D. – Department of Metabolic Care and Gerontology, Teaching Hospital, Hradec Králové
- RNDr. Ivona Voráčová, Ph.D. – Academy of Sciences of the Czech Republic, Institute of analytical chemistry, Brno
- Prof. ing. Jiří Cabal, CSc. – Faculty of Science, University of Hradec Králové, Hradec Králové
- Prof. PharmDr. Petr Pávek, Ph.D. – Faculty of Pharmacy, Charles University, Hradec Králové

ACHIEVEMENTS

Publications

More than 50 publications in international journals with impact factor in the field of analytical chemistry.

Patents

- Solich P., Sklenářová H., Chocholouš P., Šatínský D., Andruch V., Škrlíková J.: A device for sequential injection analysis for liquid-liquid extraction, Czech Patent Number 304296, 2014.
- Solich P., Šatínský D., Chocholouš P., Sklenářová H.: Separation and Detection of Mixed Samples by Sequential Injection Chromatography, Czech Patent Number 303575, 2012.