UNIVERSITY OF COPENHAGEN
DEPARTMENT OF PLANT AND ENVIRONMENTAL CHEMISTRY

3rd Nordic Symposium on Multidimensional Chromatography

08:30 – 16:30
13 November 2024

Hybrid meeting
Auditorium TBA and Online

Thorvaldsensvej 40, Frederiksberg C

Registration online: https://t.ly/zLHsQ

Everybody is welcome: students, academic staff, industrial scientists. The symposium is free of charge but registration is required, using link above or QR code. All participants will obtain a certificate of attendance signed by all speakers.

Organizers Jan H. Christensen, Nikoline J. Nielsen, Oskar Munk Kronik, Jason Devers, Josephine Lübeck, and Asger B. Hansen, University of Copenhagen. The symposium is co-organized by the Danish Society for Analytical Chemistry.

One-dimensional chromatographic systems like LC, GC and SFC often fail to achieve baseline separation of compounds in complex environmental, biological, petrochemical, food, and pharmaceutical samples. Multidimensional chromatography overcomes this limitation by using multiple separation systems, where fractions from the first column are transferred to other columns for further separation. The 3rd Nordic Symposium on Multidimensional Chromatography will cover the fundamentals of comprehensive multidimensional chromatography, where all fractions from the first column undergo additional separation in the second column. International experts will deliver 6 hours of lectures ranging from the basics to cutting-edge research.

PROGRAM

08:30 - 09:00 **Registration, coffee and exhibition**

09:00 - 09:30 **2D or not 2D – an appetizer from a pioneer in 2D separations of food analysis**

Hans-Gerd Janssen
Unilever R&D and Wageningen University

Improving system understanding of biological and environmental samples requires the ability to reliably identify chemical compounds. Due to the large number of chemical compounds present in many samples of interest, conventional one-dimensional chromatographic techniques do not suffice to provide adequate resolution. This motivates the use of multidimensional chromatography in order to improve on separation performance and identification. In this talk, Hans-Gerd Janssen will show how these challenges can be overcome or minimized using multidimensional chromatography.
Hans-Gerd Janssen is head of the chromatography and mass spectrometry expertise group of the Unilever Foods Innovation Center and part time professor at Wageningen University. His research areas include applications and theoretical aspects of all types of chromatography and mass spectrometry. He applies these methods mainly in food analysis.

09:45 - 11:15 **Multidimensional LC: Fundamental aspects, strategies for method development and improved sample characterization.**

André de Villiers
Department of Chemistry and Polymer Science, Stellenbosch University

Multidimensional liquid chromatography (LC×LC) is increasingly valuable for resolving complex mixtures. The two interdependent dimensions of LC×LC require careful consideration of various factors to develop an optimal method. The extensive considerations necessary for method development in LC×LC partly limit its broader application. This talk will cover state-of-the-art strategies for method development, including in-silico optimization, and will delve into the fundamental theoretical aspects of LC×LC. Additionally, the presentation will demonstrate the detailed information embedded in LC×LC data and the conclusions that can be drawn from this data.
The research of André de Villiers focuses on advanced separation techniques. He has published 79 papers and a book chapter and received numerous awards, including the Csaba Horváth Memorial Award, South African Chromatographic Society's Chromatographer of the Year (2012), LCGC's Emerging Leader in Chromatography, and the South African Chemical Institute's Raikes Medal. He chairs the Western Cape board of the South African Chromatographic Society and is an editorial board member for Journal of Chromatography A, Chromatographia and LCGC.

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11:15 - 12:15 **Exhibition, poster session and lunch**

12:15 - 13:45 **SFC in multidimensional chromatography: the latest advances and what lies ahead**

Karine Faure
University of Lyon

Supercritical fluid chromatography (SFC) is a versatile technique that enables diverse chromatographic interactions. Its use in multidimensional chromatography, whether in SFC×SFC or LC×SFC setups, offers significant orthogonality. Recently advancements have resolved technical issues in combining SFC with other separation techniques, leading to emerging applications for analyzing industrial and biomass products.
Karine Faure heads the Chromatography and Hyphenated Techniques group at the Institute of Analytical Chemistry, University of Lyon. Her research focuses on the analysis of industrial and recycled products using 2D-LC and more recently SFC.

14:00 - 15:30 **Fundamentals and applications of GC×GC in food analysis**

Peter Tranchida
University of Messina

Comprehensive two-dimensional gas chromatography (GC×GC) allows for chromatographic separation using two orthogonal columns, delivering multiplicative peak capacity and structured chromatograms, in addition to more accurate and sensitive quantification in complex samples compared to conventional GC-MS.

Peter Tranchida is Professor in Food Chemistry at the University of Messina, his work focuses on food analysis primarily using GC×GC. He has been awarded both the John Phillips and GC×GC Lifetime Achievement Award for his contributions to the field. Prof. Tranchida will present on the evolution of GC×GC and summarise the current state of the art in GC×GC analysis.

15:30 - 16:15 **Exhibition, poster session, coffee and cake**

16:15 - 17:00 **How to overcome the bottleneck of extracting relevant information in multidimensional data?**

Jan H. Christensen
Giorgio Tomasi
University of Copenhagen

Recent years have seen significant improvements in multidimensional chromatography hardware. However, its use is often limited to detailed characterization of single samples or comparing a few samples, while in-depth analysis of larger sets remains unfeasible. Developing sophisticated data processing workflows is essential for broader application. This presentation will explore the current status of multidimensional data processing workflows and discuss future directions in the field.

Jan H. Christensen is Professor in Environmental Analytical Chemistry and Giorgio Tomasi is Associate Professor in Signal Processing in Environmental Chemometrics at University of Copenhagen. They have worked with signal processing for 1D- and 2D chromatography data for >20 years.

17:00 - 17:15 **A few final words from the organizers**

PHD COURSE 11-12th, [Symposium: 13th], 14-15th November 2024

PhD course in practical multidimensional chromatography: Students will be introduced to the fundamental concepts of multidimensional separational techniques encompassing GC, LC and SFC. Following hands on laboratory sessions, analysing samples using pulsed-elution and comprehensive LC×LC, plus comprehensive GC×GC, students will gain practical experience in the most common data analysis and chemometric strategies in two dimensional chromatography. Students will also attend the symposium on November 13th.

SYMPOSIUM POSTER SESSION

Posters are invited from students at all levels.

Registration for Symposium, PhD course, and Poster Submission online: https://t.ly/zLHsQ