



HTC-11

Hyphenated Techniques for Chromatography

HTSP

Hyphenated Techniques for Sample Preparation

One-day Short Course

Miniaturized sample preparation methods

Course Teachers

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Course summary

The course will cover both basic and advanced topics related to new fundamental developments and applications in small-size sample preparation devices. Because these techniques only require minute amounts of organic solvents – if any – and because of many additional advantages (convenience, ease of automation, transportability) these techniques are having a gigantic impact in many fields.






The principles of Solid Phase Microextraction (SPME) Membrane Extraction with Sorbent Interface (MESI) Needle Trap (NT) and liquid-phase microextraction (LPME) will be presented in relation to practical problems.

Thermodynamic and kinetic theory of direct and headspace SPME and related techniques such as Thin Film Microextraction (TFME), as well as the effects of stirring, temperature and sample volume and matrix modification on the amount extracted will be discussed. A complete method development will be described and illustrated by real life examples. The following stages will be covered: selection of extraction techniques, extraction phase, selection of sampling mode (direct vs. headspace), determination of the desorption mode and time, selection of the calibration method, determination of the linear range of the method, as well as determination of method limit of detection, precision and accuracy. Practical aspects of coupling miniaturized sample preparation techniques with GC and HPLC will also be discussed.

The various modes of Liquid-Phase Microextraction (LPME) will be discussed, with particular focus on the operational details and aspects, and practical tricks and tips of this suite of techniques. The topics to be discussed include the “original” LPME, now termed single-drop microextraction, which started it all. LPME, however, is more than a single-drop approach to miniaturized liquid-liquid extraction. Hollow-fibre LPME, perhaps the most versatile of the

LPME procedures, will also be covered. Various examples of LPME applications will be presented, ranging from environmental to biological analysis. These will encompass two-phase (extraction from aqueous sample → organic extractant) as well as three-phase (extraction from aqueous sample → organic intermediary solvent → aqueous extractant) approaches. The use of the solvent-loaded hollow fibre as a micro-reactor to enhance extraction and/or detectability is discussed. The combination of various analytical techniques, particularly gas chromatography, liquid chromatography and capillary electrophoresis, which showcases the versatility of this sample preparation approach will be presented. Other possible uses of hollow fibres for sample preparation will also be discussed. It is hoped that with the examples presented in the course, participants will be inspired to creatively generate their own implementations of LPME to address and solve their own analytical problems, particularly when dealing with challenging matrices.

Key topics

-  General principles, advantages, and limitations of SPME and LPME
-  Various modes of extractions (extraction from a liquid, headspace sampling, two-phase and three-phase sampling, *etc.*)
-  Development and optimization of micro-extraction methods
-  Selected applications (environmental analysis, food and beverage industry, industrial hygiene, drug analysis and clinical chemistry)
-  New developments and future directions

Who should attend?

Those who want to learn an awful lot about micro-extraction methods in a very short time!

The course is targeted at all those who are using or contemplating to use micro-extraction techniques and who wish to gain a deeper insight in the methods with the aim of increasing their productivity. The course will be of interest to chemists responsible for method development, analytical chemists, laboratory supervisors, scientists and industry regulators, in the environmental, food and beverage, pharmaceutical, clinical, cosmetic, industrial hygiene and many other fields.

About the instructors

Dr. Janusz Pawliszyn is the author of over 400 scientific publications and books on solid-phase microextraction. He is a fellow of Chemical Institute of Canada, editor of *Analytica Chimica Acta*, *Trends in Analytical Chemistry* and a member of the Editorial Boards of *Journal of Separation Science*, *Analyst*, and *Chemia Analityczna*. He received the 1995 McBryde Medal, the 1996 Tswett Medal, the 1996 Hyphenated Techniques in Chromatography Award, the 1996 Caledon Award, the Jubilee Medal 1998 from the Chromatographic Society, U.K., the 2000 Maxxam Award, the Alumni Achievement Award for 2000 from Southern Illinois University, the Humboldt Research Award for 2001, the 2002 COLACRO Medal, the 2008 A.A. Benedetti-Pichler Award from Eastern Analytical Symposium, and the 2008 Principal Manning Innovation Award. He presently holds the Canada Research Chairholder and Natural Sciences and Engineering Research Council of Canada (NSERC) Industrial Research Chair in New Analytical Methods and Technologies.

Hian Kee Lee is a Professor of the Department of Chemistry at the National University of Singapore. He is the author of more than 250 scientific papers, many of which involve miniaturized extraction techniques. He is an editor of *Analytica Chimica Acta*, an Editorial-Board Member of the *Journal of Chromatography A*, and was an International Advisory Board Member of *The Analyst* from 1997-2008. He is the 2009 recipient of the Federation of Asian Chemical Societies Foundation Lectureship Award.

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