

Environmental and Analytical Chemistry

Synopsis

The most up-to-date instrumental methods for trace analysis (for both organic and trace metal contaminants) in aquatic and atmospheric samples will be presented. The basics of elemental and molecular analysis will be covered with a focus on mass spectrometry and chromatography as well as spectroscopy. Specificities of environmental sampling, sample preparation, quantification and speciation will be emphasized. Case studies will allow the discussion about the applications of these methodologies and strongly support the theoretical understanding of both their interests and limitations in studying water and air pollution.

Aims

To provide exposure to the most up-to-date analytical methodologies for both targeted and non-targeted analysis in environmental samples.

Objectives

At the end of the Unit, you should:

1. Understand the basics of the most important analytical techniques for environmental sample (aquatic and atmospheric) analysis
2. Be able to design an appropriate sample preparation and analysis procedure for a given organic micropollutant or trace metal
3. Understand the basics of non-targeted analysis
4. Know the level of implementation of the different instrumental methodologies in environmental monitoring, in relation with laws and regulations on human and environmental health

Key Skills Acquired

At the end of this Unit, you should understand:

1. The key steps of a trace analysis procedure
2. The interests and limitations of the most commonly applied or newly developed analytical methods for environmental samples

Syllabus

Topics covered include:

- Basics on mass spectrometry and coupling with chromatography

- ICP-MS methods for elemental trace analysis.
- Sample preparation methods for trace analysis in air, water, sediment and biological matrices
- Specific issues about quantification and speciation in environmental samples

Learning & Teaching

- Lectures: 23.66 hr
- Seminars : 1 hr
- Case studies : 2 hr
- Field trip: ½ day

Teaching Staff

E. Perraudin (Coord.), H. Budzinski, P. Labadie, J. Schäfer and E. Villenave

Semester

Timetable slot: TBD

ECTS: 6

Level: Compulsory

Bibliography

- E. Hoffmann. 2008. Mass spectrometry: principles and applications, John Wiley & Sons, Chichester, UK.
- V.R. Meyer. 2010. Practical high-performance liquid chromatography. John Wiley & Sons, Chichester, UK.
- S. Mitra (Ed.). 2003. Sample preparation techniques in analytical chemistry. Wiley Interscience, Hoboken, New Jersey
- Analytical techniques for atmospheric measurements, D. E. Heard, 2006, Blackwell

Assessment

- Written theory examination (80%)
- Reversed course (20%)

Course Evaluation

By completion of University Unit Evaluation Questionnaire by students, annual assessment by Unit Coordinator.