

Module Title: Soil and sediment analysis
Module Code: AM0503
Maximum Number of Students: 25
Total ECTS Credits 2
Notional Learning Hours (a) Contact Time - 10 h (b) Private Study - 40 h Format of Teaching: Lectures 10 h Laboratories or Practicals 0 h Other 0 h Teaching Strategy: Formal lectures in 60/90 min sessions.
Convener: José Fermín López-Sánchez Miquel Vidal
University / Department: University of Barcelona / Department of Analytical Chemistry
Language of Tuition: English
Module Description - The Purpose or Aims: <ul style="list-style-type: none"> ▪ To describe the principal sediment and soil phases and parameters. ▪ To understand basic concepts and practical aspects of trace element and radionuclide analysis in soil and sediment matrices. ▪ To acquire basic knowledge on operationally defined procedures for solid speciation. ▪ To recognize and understand the main problems associated with speciation studies in solid materials. ▪ To fully understand the current state of standardization and comparability of analytical data in soil and sediment analysis. ▪ To introduce the fundamentals of pollutant interaction in soils and sediments ▪ To impart knowledge on the main sorption and desorption experiments to be applied at laboratory level to understand the pollutant interaction in soils and sediments, and to predict pollutant fate in environment. ▪ To introduce the complexity of the management of contaminated soils and sediments, and of the risk assessment models.
Specific Learning Outcomes for this module: (contributing to general learning outcomes GLO 1 – GLO 10) SLO 1. Knowledge of the main soil and sediment constituents and how to analyse them. SLO 2. Understanding of the main chemical processes occurring in soils and sediments. SLO 3. Understanding of the practical use of analytical techniques in the analyses of soils and sediments. SLO 4. Knowledge of the main sorption and desorption tests used at laboratory level to examine pollutant interaction in soils and sediments. SLO 5. Ability to evaluate scenarios of contaminated soils/sediments on the basis of soil/sediment parameters, type and concentration of the pollutant, and understanding of the basic principles of the risk assessment. SLO 6. Recognize the main problems associated with the analyses of solid materials, and learning of the use of reference materials and validation methods.

Summary of Course Content:

This module explores the fundamental aspects of soil and sediment analysis, focusing on trace element pollutants (heavy metals, metalloids), and radionuclides. Topics that will be discussed include:

- Definition and soil uses. Soil profile and classification. Soil phases. Main soil parameters. Definition and analyses.
- Sediments: origin and composition. Role of sediments in the hydrological cycle.
- Occurrence of trace elements in soils and sediments: from reference to intervention levels.
- Sediment analysis: sampling, characterization and trace element determination.
- Pollutant interaction in soils and sediments. Sorption and desorption experiments. Speciation. Implications for risk assessment.
- Validation of analytical methodologies and use of reference materials.

Transferable Skills Taught:

Ability to communicate with specific terms related to soil/sediment science.
Ability to work in small groups and to elaborate written reports.
Knowledge on how to find information on available reference materials and standardization bodies.

Assessment Methods:

1. Written examination (60 %). Evaluation of SLO1 – SLO6
2. Work assignment (40 %). Evaluation of SLO4- SLO6.

Assessment Criteria:

Details of assessment methods should include forms of assessment and the contribution of each to the summative assessment of the module. The relationship to the learning outcomes of the module should be explicit and the numbers of the various learning outcomes should be attached to the assessment methods listed. Please list in numerical order.

Threshold:

SLO1, SLO2, and SLO3: Basic knowledge on the soil/sediment phases and main parameters, and related analytical techniques.

SLO4 and SLO5: Basic knowledge on the pollutant interaction in soils and sediments.

SLO6: General knowledge about analytical procedures and validation strategies.

Good:

SLO1, SLO2, and SLO3: Ability to describe the soil/sediment phases and main parameters, to recognize their role in processes, and to select the appropriate analytical techniques for solid material characterization and pollutant analyses.

SLO4 and SLO5: Ability to select the proper sorption-desorption tests to evaluate the fate of pollutants in soils and sediments, with a basic assessment of the derived risk.

SLO6: Ability to design the correct analytical strategies and to apply reference materials and validation strategies to guarantee the quality of the methods and obtained data.

Excellent:

SLO1-SLO6: Ability to integrate a deep knowledge on all the issues covered in the module to solve a case study.

Resource Implications of Proposal and Proposed Solutions:

Lectures notes will be available for students.

Recommended reading:

Environmental Chemistry, S. E. Manahan, 7th edition, CRC Press, Boca Raton, Florida, 2000.

Environmental Chemistry, G. Van Loon, S. Duffy eds., Nueva York, USA: Oxford University Press, 2000.

Manual of physico-chemical analysis of aquatic sediments, edited by A. Mudroch, J. Azcue, P. Mudroch, CRC Press, Boca Raton, Florida, 1997

Metals in the Hydrocycle, W. Salomons, U. Förstner, Springer Verlag, 1988.

Trace element speciation: Analytical methods and problems, edited by G.E. Batley, CRC Press, Boca Raton, Florida, 1989.

Chemical Speciation in the Environment, edited by A.M. Ure, C.M. Davidson, 2nd edition, Blackwell Science Ltd., Oxford, 2002

Methodologies for soil and sediment fractionation studies, edited by Ph. Quevauviller, The Royal Society of Chemistry, Cambridge (UK), 2002

The Chemistry of Soils, G. Sposito, New York-Oxford: Oxford University Press, 1989.

Metal Speciation and Contamination of Soil, H.E. Allen, C.P. Huang, G.W. Bailey, A.R. Bowers eds., Boca Raton: Lewis Publishers, 1995.

Pre-Requisites:

Any module(s) which must have been taken prior to the current module, or any specific background required to take this module.

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