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POLITECNICO
MILANO 1863

HANDS-ON TRAINING COURSE ON CHEMICAL DOSIMETRY

3-5 July 2019

Summary

This document describes the aim of the course, its structure and some logistic and practical issues.

Introduction

The evaluation of the dose in different application fields, both medical and industrial, as well as in the everyday life, is of paramount importance to avoid accident to population, workers and patients. In this perspective, this course aims at providing a general overview on the role of dosimetry and chemical dosimeters with specification on principles, properties and applications. In particular, the course will focus on different kinds of chemical dosimeters (solids, liquids and gels), on their principles and properties, as well as their practical applications. During the on-site part of the course, students will be given the opportunity to increase their practical skills with laboratory equipment for the preparation and analysis of different kinds of chemical dosimeters.

Course Structure

The course is structured in two phases. The first theoretical part is delivered as distance learning course. During this phase material related to more general topics as well as material intended to be preparatory for the topics covered during the on-site course will be distributed. Students will be provided with a self-assessment tool to evaluate their own preparation. In addition, students will be asked to successfully complete the online course on security for the access to the laboratories.

The second part, including theoretical lectures and guided practical experiences of using chemical dosimeters, will take place in Milano, at the Radiochemistry and Radiation Chemistry Laboratories of the Politecnico di Milano. Sessions are distributed from Wednesday to Friday, 09:00 to 17:00 each day, with the exception of the first day that the registration will start at 8:30.

The estimated workload of the online and on-site phases is 4 h and 40 h, respectively. The total expected effort is thus 44 h.

Course Content

The topics to be covered during the online phase – e-learning course on “Fundamentals on chemical dosimetry” – are organized in the following chapters:

1. Introduction on Dosimetry
 - Role and need
 - Example of every day radiation exposure
 - Three radioprotection principles: time, distance and shielding
2. Basics of:
 - Dosimetrical quantities (Absorbed – equivalent – effective dose, KERMA and exposure)
 - CPE (Charged Particle Equilibrium) definition
 - Correlation between KERMA and dose
3. Dosimeters
 - General principles and features required: absoluteness, accuracy and precision, dose and dose-rate range, energy dependence, stability...
 - Overview on dosimeters and applications
4. Chemical dosimetry
 - General principles
 - Radiolysis in solid and liquid
 - Radiolytic yield and correlation with dose
 - Overview on chemical dosimeters for different applications

During the on-site phase, the theoretical presentations and experimental activities will be focused on:

1. Laboratory chemical preparation of:
 - Fricke standard dosimeter
 - Fricke gel dosimeter
2. Optical 1D and 2D analysis of:
 - FAS dosimeter for industrial application
 - GafChromic films for medical application
 - Fricke standard dosimeters and Fricke gel dosimeters
 - Polymer gel dosimeters
3. Data analysis:
 - Calculation of the radiolytic yield and molar extinction coefficient for different kind of chemical dosimeters
 - Use of ImageJ Open Software for images analysis
 - Calibration curve acquisitions
4. Exercises
 - Evaluation of unknown doses
 - Evaluation of the diffusion process in Fricke gel dosimeters
 - Evaluation of isodose curves of a clinical treatment plan using GafChromic films

The main expected learning outcomes are:

- Understand the basic concepts and the role of dosimetry both for industrial and medical applications
- Have a complete overview on dosimeters: principles, features required, applications
- Understand the basic concept for chemical dosimetry and gel dosimetry
- Have an overview on cutting-edge applications of radiation chemistry, novel gel dosimeters and radiochemistry
- Increase their practical skills with laboratory equipment and optical analysis (both 1D and 2D) focused on chemical dosimetry
- Be able and confident for preparing dosimeters: Fricke-standard, other aqueous chemical dosimeters and some gel dosimeters
- Learn the main aspects of optical analysis and UV-Vis spectra data analysis for obtaining systems calibration curves and evaluating unknown doses
- Learn the main features of ImageJ Open Software for images analysis

Should I take my laptop computer?

Yes. All the course material, including lecturers' presentations, will be distributed in electronic format so that participants will be able to follow the sessions from their laptop screens. Furthermore, data analyses and practical exercises, which are crucial for a thorough understanding of the presented concepts, will be carried out on personal computers. Detailed instructions on the software to install, on how to use it and introductory exercises for the online phase will be communicated in due time.

Important dates

- 1 May 2019
Open registration
For detailed information, please visit the MEET-CINCH web page to download the application form (www.cinch-project.eu/events/courses/). Send the filled-in form to Elena Macerata (elena.macerata@polimi.it).
- 15 May 2019
Deadline registration
- 1 June 2019
Start of the online phase: e-learning course “*FUNDAMENTALS ON CHEMICAL DOSIMETRY*”
- 3-5 July 2019
On-site phase in Milano – Politecnico di Milano. Sessions start at 9:00 – end at 17:00.

Economical support

No course fee will be charged to the participants and a small budget exists to support a limited number of participants.

Venue for the on-site phase

Politecnico di Milano - Campus Bovisa Politecnico
Department of Energy - Nuclear Engineering Division - CeSNEF
Radiochemistry and Radiation Chemistry Laboratories,
Building B18 - Via La Masa, 34 Milano



www.polimi.it

<https://maps.polimi.it/maps/>

The building is at about 200 m from the closest train station named “*Milano Bovisa Politecnico*”, and about 500 m from train station “*Milano Villapizzone*”.

Travel information

Milano has an interconnected network of metro, tram and suburban trains. In particular, the Bovisa Campus of Politecnico di Milano is well connected with the city centre and with the main airports by means of train starting from “*Milano Bovisa Politecnico*” station and “*Milano Villapizzone*” station.

Trains for Malpensa airport are scheduled every 30 minutes from “*Milano Bovisa Politecnico*”.

<http://www.milanomalpensa-airport.com>

<http://www.trenord.it/en/timetable/timetable.aspx>

<https://maps.polimi.it/maps/>

Accommodation

Through the booking.com website it is possible to find different solutions at different prices. For examples:

Broglio 2 Design loft - Via Emilio Broglio, Bovisa, 20158 Milano, Italia

Hotel Sunflower - Piazzale Lugano 10, Bovisa, 20158 Milano, Italia

Bovisa House - Via Antonio Carnevali 116 , Bovisa, 20158 Milano, Italia

Residence Politecnico Bovisa - Via Lambruschini Raffaele 34, Bovisa, 20100 Milano, Italia

Milan Suite Hotel - Via Varesina 124, Certosa, 20156 Milano, Italia

Casa dolce casa - Via Michele Pericle Negrotto 16/6, Bovisa, 20156 Milano, Italia

...and many others.