

## Target group

This dedicated training course aims at delivering the basics of nuclear and radiochemistry to trainees with chemical background at Master level (chemistry masters or engineers, and/or fresh PhD students), who need to extend their skills and knowledge to the field of nuclear and radiochemistry.



## Motivation

The lack of trained nuclear chemical specialists has been identified in all branches of nuclear industry and also in other areas where skills in NRC are required, such as radiopharmacy, nuclear medicine, radiation protection and radioecology, and many others. Retraining general chemistry graduates is one of the options for mitigating this problem.



## Czech Technical University in Prague



Faculty of Nuclear Sciences and Physical  
Engineering



Department of Nuclear Chemistry



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Czech Republic

## CINCH Consortium

Cooperation In education in Nuclear CHEmistry



<http://www.cinch-project.eu>

CINCH is an EU 7<sup>TH</sup> Framework Programme project within EURATOM aiming to coordinate nuclear chemistry education and training in Europe.

The project includes the formation of a long-term EURATOM Fission Training Scheme (EFTS) providing a common basis to the fragmented activities in this field and thus move the education and training in nuclear chemistry to a quantitatively new level.

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Community Research



# HANDS

# ON

Prague 2012  
December 3-14

# TRAINING

CTU in Prague  
&  
CINCH  
Consortium

# IN

# NUCLEAR CHEMISTRY



## Objectives

While the course does not substitute full formal training, it provides fundamental theoretical knowledge of principles and concepts in nuclear chemistry necessary for understanding the processes and methods in radiochemistry, and practical hands-on training required for the work with open ionising radiation sources (handling of radioactive materials, application of radionuclides and ionizing radiation, etc.).

## Arrangements

The course is organised by CINCH Consortium and will take place at laboratories and lecture rooms of the Department of Nuclear Chemistry of CTU in Prague. Over the 2 weeks of the course (December 3-14) the participants will attend lectures and pass thematic practical exercises. Obligatory deliverables will be filled-in lab reports and short presentations. All teaching will be in English. The course will be run on working days from 8:30 to 18:00.

## Admission Requirements

For application for attendance of the course, please visit the CINCH web pages at [www.cinch-project.eu/?art=courses](http://www.cinch-project.eu/?art=courses), download the application form and send the filled-in form to Štěpánka Maliňáková ([malinakova@fjfi.cvut.cz](mailto:malinakova@fjfi.cvut.cz)). A small budget exist to support limited number of participants. Application deadline is November 26.

## Accommodation

Rooms at CTU campus in Prague or in nearby hotels will be available. If accommodation is needed, mark it properly in your application form. For additional accommodation details or needs, please contact [malinakova@fjfi.cvut.cz](mailto:malinakova@fjfi.cvut.cz).

## Travel Information

<http://www.idos.cz>

<http://www.dpp.cz/en/>

<http://www.prg.aero/en/>

## Introductory lectures

### Fundamentals of nuclear chemistry 1

Structure and properties of atomic nuclei. Classification of radionuclides. Kinetics of radioactive decay. Radioactive equilibria. Binuclear reactions. Yield of nuclear reactions.

### Fundamentals of nuclear chemistry 2

Natural radioactivity. Radioactive decay chains. Nuclear fission, fission products. Hot atoms chemistry. Szilard-Chalmers system. Radiation chemistry. Actinides and transactinides.

### Radiation detection, dosimetry, protection

Interaction of IR with matter ( $\alpha$ ,  $\beta$ ,  $\gamma$ , neutrons). Detection of ionizing radiation (detector types, principles). Dosimetry of ionizing radiation. Radiation protection

### Separation methods in radiochemistry

Separations in radioactive and trace systems. Extraction methods (L-L, principles, instrumentation). Chromatography (principles, instrumentation). Other separation methods used in nuclear chemistry.

### Radioanalytical methods

Indicator methods. Isotope dilution analysis. Radio-reagent methods. Interaction methods. Determination of selected radionuclides.

## Practical exercises

Alpha-spectrometry – sample preparation and measurement. Determination of alpha-emitting radionuclide.

Handling of radioactive materials (pipetting, work behind shielding).

Liquid scintillation counting using Triathler.

Szilard-Chalmers reaction ( $^{80}\text{Br}$  and  $^{80\text{m}}\text{Br}$  separation) on brombenzene.

Gamma-spectrometry – calibration, efficiency, measurement. Determination of  $^{137}\text{Cs}$  in river water.

Purification of uranium by liquid-liquid extraction, specific activity of uranium.

Contamination survey, decontamination, preparation of wipe smear samples.

Radionuclide generator preparation and milking.

Delayed neutron activation analysis at CTU training reactor Vrabc VR-1.



[www.cinch-project.eu](http://www.cinch-project.eu)  
[www.jaderna-chemie.cz](http://www.jaderna-chemie.cz)  
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