



INTERNATIONAL ATOMIC ENERGY AGENCY (IAEA)

Technical Meeting on The application of microanalytical techniques based on nuclear spectrometry to the characterization of materials of importance for the nuclear power

7-11 October 2013, IAEA Headquarters, Vienna, Austria

INFORMATION SHEET AND CALL FOR PAPERS

BACKGROUND

The nuclear power is utilized by many IAEA member countries to cover a considerable part of their urban and industrial energy needs. Its generation is strictly controlled and monitored in order to minimize the operational risks and limit the environmental impacts. The efforts of the international scientific community are mainly targeted to:

- a strict and more demanding quality control of different nuclear materials (e.g. nuclear fuels, structural materials, coolant, moderator);
- the acceleration of the efforts to develop new advanced types of nuclear reactors (Generation III and IV reactors) and, finally
- the promotion of the efforts to produce, in the future, cleaner and safer electricity using nuclear fusion.

The micro-analytical techniques based on nuclear spectrometry can play an important role and contribute to the achievement of these goals. The various nuclear radiation probes (e.g., x-rays, charged particle- and neutron beams) can support through a plethora of associated analytical techniques an advanced characterization of nuclear materials fulfilling the requirements imposed by their functional or structural use.

The amount of trace element impurities which can be tolerated in different types of reactor fuels, their density and quality, the composition of the cladding, moderator and absorber but also the investigation of the structure and environmental behavior of the fission fragments and the actinides produced during the nuclear fuel cycle are extremely important areas where the application of nuclear spectrometry based micro-analytical techniques can play a dominant role.

High sensitivity (down to the ng/g level or below) and selectivity, multi-elemental capability, short duration of the measurement are just a few of the many advantages of these techniques. Novel X-ray spectrometry techniques and equipment can extend and complement the capabilities of the conventional chemical analytical and spectroscopic techniques for nuclear materials characterization. Moreover, since some of these materials are radioactive, the analysis should be ideally non-invasive or at least use a minimum of sample (microgram level) so that the radioactive waste generated, and radiation exposure to the detector and operator are minimal. X-ray spectrometry techniques like the

Total Reflection X-ray Fluorescence Analysis (TXRF) can fulfil these requirements to a great extent even at the laboratory scale. New instrument and method developments are exploring the applicability of X-ray spectrometry techniques for Pu assay of spent fuel through high resolution X-ray spectrometry (hiRX) with the use of doubly curved crystals (DCC) or through the Synchrotron Induced Ultra-high energy X-ray fluorescence (UHEXRF) to provide spatially resolved non-invasive analytical characterization of nuclear fuel within the Zircaloy cladding.

On the other side, the surface- (e.g. X-ray photoelectron spectroscopy (XPS), Auger electron spectroscopy (AES), secondary ion mass spectrometry) and the accelerator-based (e.g. Rutherford backscattering spectroscopy (RBS), nuclear reaction analysis (NRA), and particle induced X-ray or gamma ray emission (PIXE, PIGE)) analytical techniques can offer information on the composition of surface and near-surface layers. Other micro-analytical techniques (e.g., the scanning and transmission electron microscopy (SEM and TEM)), the X-ray diffraction and small angle neutron scattering (SANS) can provide valuable and complementary information for the morphological and structural characterization of nuclear and fusion materials. These techniques are continuously exploited to offer as much as possible information regarding the processes taking place during irradiation.

OBJECTIVES

The Technical Meeting aims to provide a discussion forum of among specialists having the following objectives:

1. To review the current status and trends in the development of nuclear spectrometry based micro-analytical techniques for nuclear materials characterization;
2. To identify new areas where nuclear spectrometry based techniques can effectively address analytical requirements imposed on nuclear materials;
3. To support exchange and sharing of cross-cutting information and know-how between scientists working in R&D of nuclear spectrometry based micro-analytical techniques for nuclear materials characterization;
4. To provide recommendations to IAEA and Member States how to support further development and optimization of nuclear spectrometry based micro-analytical techniques for fulfilling requirements for more advanced and integrated characterization of nuclear materials; and
5. To prepare the proceedings of the meeting (Technical report).

PARTICIPATION

The Meeting is targeted for professionals working on nuclear spectrometry based on various radiation probes (x-rays, charged particle beams, neutrons etc) for the characterization of materials of importance for the nuclear power. A person will be eligible to participate only if nominated by the Government of an IAEA Member State (Ministry of Foreign Affairs or National Atomic Energy Authority) or by an Organisation invited to participate. **Nomination** for participation (see **Form A**) and title of contribution (**Form B**) with **abstract** should be received by the IAEA not later than **16 August 2013**. The participant should be a developer and/or user of micro-analytical techniques based on nuclear spectrometry for nuclear materials characterization.

SUBMISSION OF ABSTRACTS AND PAPERS

A contribution in the form of a 1 page abstract covering his/her work relevant to the objectives of the meeting is necessary to be submitted by the participant. The abstract must be formatted according to the guidelines on formatting papers.

Important: *Contributors of material to be included in the Agency proceedings must assign all copyrights or rights to publish to the Agency.*

The authors should make sure that the files do not include copyrighted fonts/materials or other impediments for reproduction.

The abstract shall be prepared according to the following instructions:

- 1) Page size: A4 (21 x 29.7 cm) – vertical orientation
- 2) Margins 25mm all around; and
- 3) Layout:
 - Title: single-spaced, 14-point size, Times New Roman Font (TNR), **bold**;
 - Authors: single-spaced, 12-point size, TNR Font;
 - Affiliation: single-spaced, 12-point size, TNR Font, *italic*;
 - Text: 1.5 spaced, 12-point size, TNR Font; and
 - Length: one page.

Important: *When sending Microsoft Word files, authors should use True Type Embedded Fonts (to save the file, click Tools, then Options, and tick Embed True Type fonts. This will help to prevent change of fonts when the file is read in a different system, as it will be in most of the cases). If possible, please also send your abstract in PDF format*

Full 5-10 pages papers are requested to be submitted prior to **September 30, 2013** for inclusion in the TM report. Instructions for formatting the manuscripts will be emailed to the selected participants.

FINANCIAL SUPPORT

The IAEA is generally not in a position to bear the travel and other costs of designated participants in the meeting. Limited funds are, however, available to help cover the cost of participants from Member States eligible to receive technical assistance under the IAEA's technical cooperation programme. Such assistance can be offered, upon specific request, to one participant per country provided that, in the IAEA's view, the participant will make an important contribution to the meeting. The application for financial support should be made at the time of designation of the participant.

It should be noted that compensation is not payable by the IAEA for any damage to or loss of personal property. The IAEA also does not provide health insurance coverage for participants in meetings, workshops or training courses or for consultants. Arrangements for private insurance coverage on an individual basis should therefore be made. The IAEA will, however, provide insurance coverage for accidents and illnesses that clearly result from any work performed for the IAEA.

If your Government should wish, in addition, to appoint one or more observers to assist and advise the designated participant in the meeting, their name(s) should reach the IAEA by **16 August 2013**. In accordance with the established rules, Governments are expected to bear the cost of attendance of any observers they may send to IAEA meetings. Compensation is not payable by the IAEA for any damage to or loss of observers' personal property or for illness, injury or death occurring while travelling to or in connection with their attendance at IAEA meetings.

As subsequent correspondence will be exchanged directly between the Scientific Secretary for the meeting, Mr [\[Andreas-Germanos Karydas\]](#) of the Division of [Physical and Chemical Sciences](#), and the participants, the full names and complete contact details (including postal address, telephone/fax numbers, and email address) of designated participants should be provided

MEETING FORMAT

To facilitate the publication of the proceedings, participants are invited to contribute an oral presentation on a subject relevant to the scope and objectives of this meeting. Participants should submit an abstract of their proposed presentation along with their nomination. The official language of the meeting is English. No translation will be provided. It is expected that the meeting will start at 9:00 on Monday 7th October 2013 and conclude by 13:00 on Friday 11th October 2013.

The outputs of discussions will be recorded for possible dissemination to Member States as an IAEA technical publication. Please, complete, sign, **attach to your abstract** and send the **Form B** to the IAEA Scientific Secretary by post or e-mail.

LOCAL ARRANGEMENTS

It is the responsibility of all participants to make their own travel arrangements to/from Austria. Detailed information on accommodation, local transport to/from the meeting venue, and other organisational details, will be sent to all designated participants well in advance of the meeting.

VISA

Designated participants who require a visa to enter Austria should submit the necessary application to the nearest diplomatic or consular representative of Austria well in advance of entry. An official letter of invitation will be issued to all designated participants by the IAEA Scientific Secretary.

DEADLINES

- **16 August 2013:** Submission of requests to the IAEA for participation (Forms A and B), financial support (Form C) and **abstract of the contribution**;
- **30 August 2013:** Participants informed of their acceptance of participation and request for financial support; and
- **30th of September 2013: Submission of a full paper**

IAEA SCIENTIFIC SECRETARY

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