



# **International Workshop on the Chemistry of Fuel Cycles for Molten Salt Reactor Technologies**

**2 – 6 October 2023**

**Ref. No.: EVT2205115**

Hybrid Event

## **Information Sheet**

### **Introduction**

Molten salt technologies are attracting great interest in the public and private sectors for a broad spectrum of nuclear applications worldwide. Most efforts at the international level are devoted to Molten Salt Reactor (MSR) technologies and, to some extent, safety, and licensing. Besides generating electricity within a once-through uranium fuel cycle, MSR technologies envision new opportunities to rationalize nuclear fuel cycles by using various fuel resources to produce high-temperature heat and potentially create a cost-competitive, safe, and sustainable commercial nuclear option. The chemistry of fuel cycle(s) plays a crucial role in developing and deploying MSRs, as recognised by the members of the NEA Expert Group on Fuel Recycling and Waste Technology (EGFRW) and of the IAEA Technical Working Group on Nuclear Fuel Cycle Options and Spent Fuel Management (TWG-NFCO). Addressing the challenges of chemical processes and technologies in MSR fuel cycles will provide added value to the scientific community, MSR developers and future user countries.

The IAEA and the NEA are organising a joint workshop from 2 to 6 October 2023 to assess the progress in the development of MSR fuel cycles from a chemistry perspective (e.g., fresh fuel synthesis, online processing and irradiated fuel reprocessing) and identify the needs and gaps in chemical processes and technologies.

## Objectives

The purpose of the event is to share technical information on the chemistry of the processes and chemical technologies of the fuel cycles for molten salt reactor systems, including input from developers about planned fuel cycle options, identify the state of the art, R&D needs, infrastructure (e.g., specific devices and process equipment) and knowledge gaps, and discuss potential ways to address these matters. The ultimate goal is to support the development and deployment of molten salt reactor systems.

## Target Audience

The event is designed for experts from NEA member countries and IAEA member states including a broad range of stakeholders with knowledge of the chemistry of the fuel cycles of molten salt reactor technologies: e.g., MSR developers and vendors, regulators, governmental authorities, industry, R&D and waste management organizations. Participants should be actively involved in the subject of the event and have experience and/or expertise in the relevant topics.

## Working Language(s)

English.

## Expected Outputs

The event will provide the basis for preparing a report reflecting the state of the art, discussions during the event and recommendations for future activities to address the identified gaps in the chemistry and chemical technologies of the fuel cycles for molten salt reactor systems.

## Topics

Papers and presentations covering one or more of the following topics are welcomed:

- Chloride and fluoride fuel salt preparation
  - $^{37}\text{Cl}$  or  $^7\text{Li}$  enrichment
  - Conversion of source material to halides
  - Impurities and their impact on salt chemical properties and behaviour
  - Process flowsheets and industrial-scale equipment for salt synthesis and purification
- Online and/or at-line processing
  - System studies and conceptual flowsheets
  - Development of separation processes

- Monitoring and control of salt composition, off-gas composition and treatment, redox potential
- Development of scalable technologies, specific devices and process equipment
- Waste forms and potential ways of conditioning
- Offline reprocessing of used fuel (on reactor site or centralised)
  - System studies and conceptual flowsheets
  - Development of separation processes
  - Development of scalable technologies, specific devices and process equipment
  - Waste forms and potential ways of conditioning
- Cross-cutting needs
  - Computational and modelling of processes applicable to MSR fuel cycle technology (including fuel cycle modelling)
  - Thermochemical data relevant to MSR fuel cycle processes (e.g., separation factors, and activity coefficients)
  - Standardisation
  - Material compatibility (e.g., materials selection with regards to chemical processes and technologies, management of corrosion and fission products)
  - Incorporating safeguards by design

The following topics are outside the scope of the workshop and will be considered as boundary conditions:

- Measurements methods, tools and techniques for determining thermo-physical properties of fresh and irradiated salts (fuel and coolant)
- Sources for irradiation
- Corrosion and material degradation mechanisms
- Waste management (e.g., repositories)

These topics are important, however, they are not germane to the objectives of this workshop and can be addressed in future activities.

## Participation and Registration

All persons wishing to participate in this event have to be designated by an IAEA Member State or should be members of organizations that have been invited to attend.

To be designated by an IAEA Member State, participants are requested to send the **Participation Form (Form A)** to their competent national authority (e.g., Ministry of Foreign Affairs, Permanent Mission to the IAEA or National Atomic Energy Authority) for onward transmission to the IAEA by **25 August 2023**. Participants who are members of an organization invited to attend are requested to send the **Participation Form (Form A)** through their organization to the IAEA by the above deadline.

Selected participants will be informed in due course on the procedures to be followed with regard to administrative and financial matters.

## Papers and Presentations

Participants are expected to present papers falling within the scope of topics listed above. All papers must be original and should not have been published elsewhere.

Participants who wish to give presentations are requested to submit an extended abstract before **25 August 2023** via the web-based file submission system IAEA-INDICO. The extended abstract should be **less than 5 pages, including figures and tables, summarising the key messages of your presentation, and be fully related to at least one of the topics of the Workshop listed above.**

Papers can only be considered if the **Participation Form (Form A)** and the **Form for Submission of a Paper (Form B)** have been submitted by the author to their competent national authority (e.g., Ministry of Foreign Affairs, Permanent Mission to the IAEA or National Atomic Energy Authority) or their organization for onward transmission to the Scientific Secretary of the event, not later than **25 August 2023**.

## Additional Information (need to add the VIC info)

The International Workshop will take place at IAEA Headquarters (VIC) in Vienna, Austria. The agenda with details of the meeting room and link to access the online component will be sent to the designated participants before the event.

## Organization

### IAEA Scientific Secretary

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Subsequent correspondence on scientific matters should be sent to the Scientific Secretary and correspondence on other matters related to the event to the Administrative Secretary.