



Regional Workshop on the development and use of geopolymers as radioactive waste matrix

Hosted by

The Government of the Czech Republic

through the

UJV Rez a.s.
Conference centre of ÚJV Řež

29 May to 02 June 2023

Ref. No.: ME-RER9154-EVT 2300568

Information Sheet

A. Purpose

The purpose of the event is for the participants to practice (i) the encapsulation of mixed waste into different geopolymers (as an immobilization matrix for radioactive waste), and (ii) waste form testing, to determine the durability of the manufactured waste forms.

The meeting will include experience and lessons learned from processing, waste form properties, waste package durability as well as practical's to produce these waste forms and perform waste form tests on the manufactured waste forms.

B. Working Language(s)

The working language(s) of the event will be English with no interpretation provided. All communications, abstracts and papers must be submitted in this language.

C. Deadline for Nominations

Nominations received after **11 April 2023** will not be considered.

D. Project Background

Geopolymers, or alkali-activated aluminosilicate cements or binders as they are also known, were first discovered in early 20th century, and since then have gradually been developed into usable applications in different areas of industry, mainly as construction, ceramic, fireproof and painting materials.

Despite geopolymeric materials having been utilized for ~100 years, it is only within the last 20 years that efforts have been made toward deployment of geopolymers within the nuclear industry. The applications to date are predominantly oriented towards the immobilization of radioactive waste. Experience in this area has been gained in a number of Member States including the UK, Slovakia, Australia, USA and China. A variety of geopolymer matrices for immobilization of radioactive waste and high waste loading capabilities of the matrices, continues to show promise for the immobilization of “challenging” radioactive waste streams. To date the usage of geopolymers as construction or shielding materials for substitution of ordinary Portland cement concrete in nuclear industry (resistant to extreme conditions of radiation fields) is not explicitly published.

To support Member States in the management of radioactive waste, the IAEA is organising a dedicated workshop on the development and the use of geopolymers as radioactive waste matrices.

E. Expected Outputs

As a result of the workshop, the participants will:

- List key factors influencing the selection and design of waste forms for different waste streams;
- Take cognisance of current status and challenges in geopolymer waste form performance testing;
- Be knowledgeable regarding the current status of encapsulating “difficult waste streams” into geopolymers;
- Prepare a geopolymer waste form and perform waste form testing.

F. Scope

The five-day Regional Workshop will include lectures, structured discussions and underpinned by exercises designed to practice and reinforce the development and the use of geopolymers as radioactive waste matrixes. Examples of contents that are being planned (depending on availability of experts) of the five-day workshop:

Day 1: General Lectures:

- Basis of geopolymer chemistry (including curing mechanism);
- Designing of geopolymer matrix for waste compositions (including alternative binders (alkali-activated binders, phosphate binders, calcium aluminate and sulfoaluminate binders) for the conditioning of deleterious wastes).

Day 2: Lectures on practical manufacturing of waste forms;

- Optimization of geopolymer process (operational temperature, waste type, geopolymer composition, loading capacity);
- Non-conformity issues, problems detected during operation, drawbacks of the different types of geopolymer processes.

Day 3: Site visit with a practical component:

- Site visit to UJV for demonstration of semi pilot solidification line installed by Chemcomex for the solidification of waste with geopolymers;
- Participants will be divided into groups to encapsulate “waste” into geopolymer material (raw material supplied by Chemcomex) in a laboratory. The produced ALUSIL product samples (monoliths) by the different groups will be “waste form tested” on Friday in conference room.

Day 4: Lectures on durability measurements;

- Performance testing of geopolymer matrix;
- Long-term behaviour of geopolymer waste packages during disposal.

Day 5: Lectures and closing:

- Demonstration of simplistic waste form testing using manufactured participant monoliths to determine the best geopolymer waste form (group);
- Final lectures and closing of workshop.

G. Participation

The meeting is open to Member States participating in the **RER9154** project: Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Georgia, Greece, Hungary, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Malta, Montenegro, North Macedonia, Poland, Portugal, Republic of Moldova, Romania, Russian Federation, Serbia, Slovakia, Slovenia, Tajikistan, Türkiye, Turkmenistan, Ukraine, and Uzbekistan

H. Participants' Qualification and Experience

The event is targeted at representatives with a current or future programme or project regarding the use of geopolymers to immobilize radioactive waste. In order to maximize the exchange of information, individuals attending should be from all Member States with nuclear facilities, NPPs, waste management facilities, regulatory body, research facilities or from non-governmental or international organizations that represent such programmes regionally or worldwide

Participants must be nominated by the competent national authority of the Member State and, most specifically, by the Member States' official counterpart for the project.

Please note that participants will be expected to share information outlining their experience or needs regarding the use of geopolymers for the encapsulation of radioactive waste storage as part of a radioactive waste management plan.

I. Papers and Presentations

The IAEA encourages participants to give presentations outlining their experience or planned activities regarding the conditioning of radioactive waste using geopolymers as part of a radioactive waste management plan, highlighting challenges and issues on the work of their respective institutions that falls under the topics listed above.

Participants who wish to give presentations are requested to submit the presentation electronically to Mr Meyer (W.Meyer@iaea.org) the Scientific Secretary of the event not later than **28 April 2023**.

Authors will be notified of the acceptance of their proposed presentations by **5 May 2023**.

J. Application Procedure

Candidates wishing to apply for this event should follow the steps below:

1. Access the InTouch+ home page (<https://intouchplus.iaea.org>) using the candidate's existing Nucleus username and password. If the candidate is not a registered Nucleus user, she/he must create a Nucleus account (<https://websso.iaea.org/IM/UserRegistrationPage.aspx>) before proceeding with the event application process below.

2. On the InTouch + platform, the candidate must:
 - a. Finalize or update her/his personal details, provide sufficient information to establish the required qualifications regarding education, language skills and work experience ('Profile' tab) and upload relevant supporting documents;
 - b. Download and complete the [Designation of Beneficiary and Emergency Contact Form](#), and upload to InTouch+ ('Profile' tab under the personal section) specifying the document name. If already provided, kindly discard this step; and
 - c. Search for the relevant technical cooperation event (**EVT2300568**) under the 'My Eligible Events' tab, answer the mandatory questions and lastly submit the application to the required authority.

NOTE: Completed applications need to be approved by the relevant national authority, i.e. the National Liaison Office, and submitted to the IAEA through the established official channels by the provided designation deadline.

For additional support on how to apply for an event, please refer to the [InTouch+ Help page](#). Any issues or queries related to InTouch+ can be addressed to InTouchPlus.Contact-Point@iaea.org.

Should online application submission not be possible, candidates may download the nomination form for the meeting from the IAEA website and submit their applications to their National Authorities. The nomination forms once fully approved can be submitted by e-mail in a PDF format through the official channels via the IAEA Official E-Mail (Official.Mail@iaea.org) with copy to Ms Deufrains (K.L.Deufrains@iaea.org) and Mr Bru (Y.Bru@iaea.org).

NOTE: A medical certificate signed by a registered medical practitioner dated not more than four months prior to starting date of the event must be submitted by candidates when applying for a) events with a duration exceeding one month, and/or b) all candidates over the age of 65 regardless of the event duration.

K. Administrative and Financial Arrangements

Nominating authorities will be informed in due course of the names of the candidates who have been selected, and will at that time be informed of the procedure to be followed with regard to administrative and financial matters.

Selected participants will receive an allowance from the IAEA sufficient to cover their costs of lodging, daily subsistence and miscellaneous expenses. They will also receive either a round-trip air ticket based on the most direct and economical route between the airport nearest their residence and the airport nearest the duty station through the IAEA's travel agency AX Travel Management, or a travel allowance, or they will be reimbursed travel by car/bus/train in accordance with IAEA rules for non-staff travel.

L. Disclaimer of Liability

The organizers of the event do not accept liability for the payment of any cost or compensation that may arise from damage to or loss of personal property, or from illness, injury, disability or death of a participant while he/she is travelling to and from or attending the course, and it is clearly understood that each Government, in approving his/her participation, undertakes responsibility for such coverage. Governments would be well advised to take out insurance against these risks.

L.: Note for female participants

Any woman engaged by the IAEA for work or training should notify the IAEA on becoming aware that she is pregnant.

The Board of Governors of the IAEA approved new International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources. The Standards deal specifically with the occupational exposure conditions of female workers by requiring, inter alia, that a female worker should, on becoming aware that she is pregnant, notify her employer in order that her working conditions may be modified, if necessary. This notification shall not be considered a reason to exclude her from work; however, her working conditions, with respect to occupational exposure shall be adapted with a view to ensuring that her embryo or foetus be afforded the same broad level of protection as required for members of the public.

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