STREAM

SUSTAINABLE TREATMENT AND IMMOBILISATION OF CHALLENGING WASTE

WP6

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Tri PHUNG
Anthony BANFORD

Co-funded by the European Union under Grant Agreement n° 101166718

Programme Management

Predisposal

EBS

Geoscience

Optimisation

Safety Case

- Innovative characterisation techniques for large volumes (WP5 – ICARUS)
- **Sustainable treatment and immobilisation of challenging wastes (WP6 – STREAM)**
- Long-term performance of waste matrices (WP7 – L'OPERA)

PREDIS

EU-project PREDIS

Pre-disposal management of radioactive waste

WP6 – SUSTAINABLE TREATMENT AND IMMOBILISATION OF CHALLENGING WASTE - STREAM

Innovative and sustainable design, optimization and upscaling of treatments and conditioning materials for the predisposal of problematic waste

4 M€ (funded 50 %)

5 years

↳ 1,6 M€/ 2ans

24 partners
14 countries
17 RE
3 TSO
4 WMO

CEA, RE, France
Hélène Nonnet → Anne Fornier

ORANO, CIEMAT, UAM, CSIC, CNRS, IMT Atlantique, POLIMI, UNIPI, ENRESA, IAE, INCT, ZAG, EIMV, KIPT, RATEN, SCK CEN, SIIEG NASU, SOGIN, U Tartu, VTT

Associated Partners: NNL, NWS, PSI

SCOPE – OVERVIEW OF PLANNED TASKS

Task 1

- **Coordination**

WP Leader :
Anne Fornier

Task 2

- **Knowledge management**
  - Waste inventory
  - Technology assessment and selection

Task Leader :
Elena Torres Alvarez

Task 3

- **Study of treatment and conditioning methods**
  - Optimization of available treatment technologies and conditioning matrices based on alternative binders
  - Investigation of physico-chemical interactions between low-carbon binders and challenging waste
  - Design and characterization of low-carbon binders-based mortars

Task Leader :
Maria Cruz Alonso
(↔ Oey Tandre VTT)

Task 4

- **Scaling-up of treatment and conditioning processes**
  - Demonstrate the upscaling feasibility of processing and conditioning methods
  - Development of numerical models

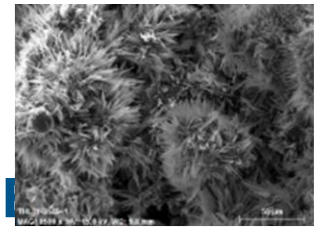
Task Leader :
Quoc Tri PHUNG

Task 5

- **Deploying safe solutions achieving cost and environmental performances following the principles of circular economy**
  - Fulfilling technical and economic requirements
  - Evaluation of fulfilment of WACs and disposability assessment

Task Leader :
Anthony Banford

KEY ACTIVITI



K-struvite in magnesium phosphate binder

Cross-section of a geopolymer matrix embedding Mg-Zr cladding

Encapsulation of ion exchange resins in a cement matrix

Lead participant	Total pm	Start Month	End month
CSIC	280	6	48

18 teams

Task 3

- **Study of treatment and conditioning methods**
  - Optimization of available treatment technologies and conditioning matrices based on alternative binders
  - Investigation of physico-chemical interactions between low-carbon binders and challenging waste
  - Design and characterization of low-carbon binders-based mortars

- **Decontamination treatments/Development of low carbon matrix/waste-matrix interaction studies/design of new matrix**
  - 3,1 Optimization of available treatment technologies and conditioning matrices based on alternative binders — POLIMI, RATEN, VTT, NNL
    - 3,1,1 Management of solid (spent IERs) and liquid organic waste — IJCLab-CNRS, NNL
    - 3,1,2 Management of metallic waste — POLIMI, RATEN, VTT, CIEMAT, INCT, KIPT, CSIC, NNL /
    - 3,1,3/3,1,4 Optimisation of geopolymers and alkali activated materials/phosphate matrix — CSIC, UAM, NNL
  - 3,2 Investigation of physico-chemical interactions between low-carbon binders and challenging waste — PSI, VTT, UAM, CSIC, NNL
    - 3,2,1 Ion exchangers — CEA_LFCM, ZAG, SIIEG NASU
    - 3,2,2 Concentrated electrolytes — PSI, NNL
    - 3,2,3 Sludges — VTT
    - 3,2,4 Incineration ashes — CEA_LECBA, NNL, SCKCEN
    - 3,2,5 Metallic waste
  - 3,3 Design and characterization of low-carbon binder-based mortars — SCKCEN, ZAG
    - 3,3,1 Evaporator concentrates and backfill materials — UAM, NNL
    - 3,3,2 Metallic waste

KEY ACTIVITIES

In-line mixing using a high shear mixer – STEMA platform

Lead participant	Total pm	Start Month	End month
SCKCEN	130	25	60

15 teams

Task 4

- **Scaling-up of treatment and conditioning processes**
  - Demonstrate the upscaling feasibility of processing and conditioning methods
  - Development of numerical models

- **Scale 1 tests/minimizing the secondary effluents/data for numerical models**
  - 4,1 Demonstrate the upscaling feasibility of treatme[illegible]s
    - Waste treatment IMT_ATLANTIQUE, CEA_LPSD, NNL
      - Metallic waste POLIMI
      - Spent IER UAM, SCKCEN, UNIPI, ENRESA, ORANO, POLIMI, VTT, CSIC, CIEMAT
    - Waste conditionning POLIMI, VTT, ENRESA, ORANO, SCKCEN, UNIPI
      - Conceptual design of mock-up UNIPI, SCKCEN, VTT
    - Application to different waste streams

Relevant data and information will be provided by the WMO

↳ **ENRESA, SOGIN, IGNALINA, NWS**

  - 4,2 Development of numerical models to simulate the large-scale experiments

Lead participant	Total pm	Start Month	End month
NNL	25	6	55

KEY ACTIVITIES

Task 5

- Deploying safe solutions achieving cost and environmental performances following the principles of circular economy
  - Fulfilling technical and economic requirements
  - Evaluation of fulfilment of WACs and disposability assessment

- **LCA-LCC analysis/WAC**
  - 5,1 Fulfilling technical and economic requirements related to the treatment and conditioning methods: providing case studies for LCA/LCC analysis

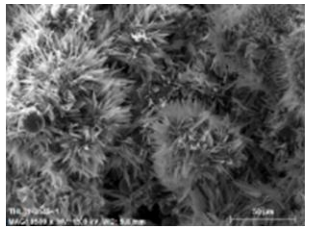
Univ Manchester and/or NNL, EIMV, UTARTU

  - 5,2 Evaluation of fulfilments of WACs and disposability assessment according to disposal facilities features (near-surface and/or intermediate-depth and/or geological)

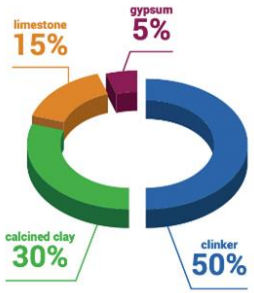
Univ Manchester and/or NNL, ENRESA, SCKCEN, SIIEG NASU

Kick Off Meeting ONLINE: 6th November 9h-13h

In-line mixing using a high shear mixer – STEMA platform



K-struvite in magnesium phosphate binder



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Encapsulation of ion exchange resins in a cement matrix

Little streams will end up making a beautiful river