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MIMOSA

MultI-recycling strategies of LWR SNF focusing on MOlten SAlt technology

More information
@MIMOSA EURATOM

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Orano recyling plant at La Hague (France)

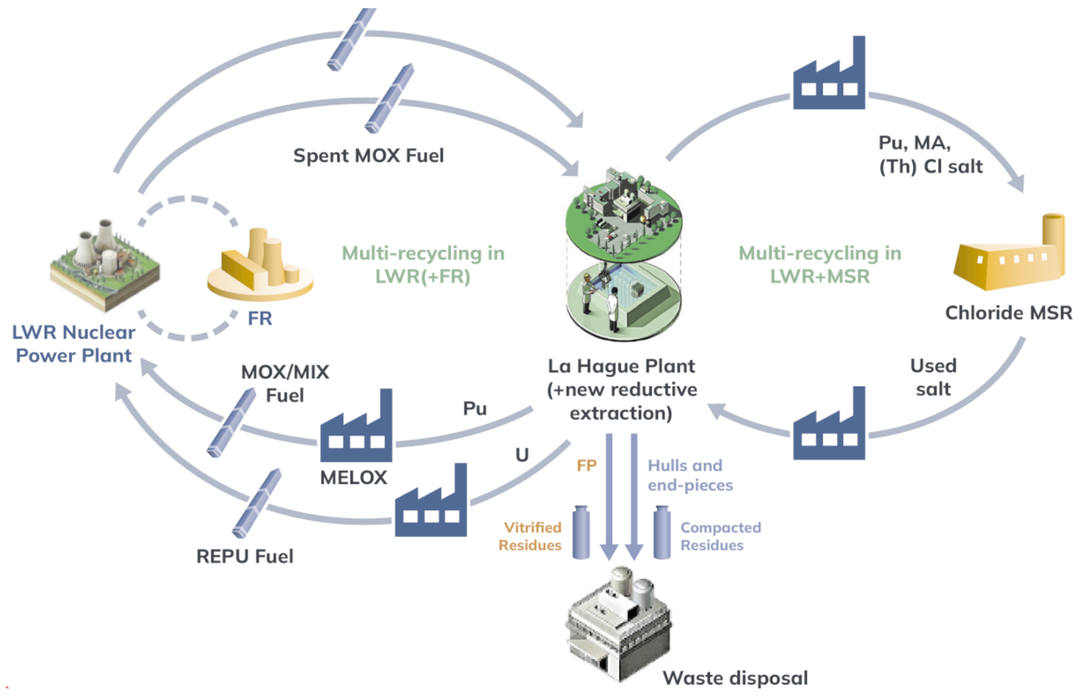
Context & objectives

Multi-recycling in light-water reactors (LWRs) is a tangible solution to move towards the closure of the fuel cycle, but it presents some limitations related to the degradation of the Plutonium (Pu) isotopic composition and the generation of minor actinides (MA), leading to an increase of vitrified high-level waste (HLW) when compared to multi-recycling with Fast Reactors (FRs).

Significant improvement in converting all the Pu isotopes and MA into Fission Products (FPs) with shorter half-lives can be achieved with the introduction of advanced FR systems, among which the molten salt reactor (MSR) using Chloride salt is a particularly promising option. There is no experience to this date with Chloride MSRs (Cl MSRs) in operation, but they have been studied and tested on experimental set-ups, showing a great improvement in the conversion rate of actinides.

For these reasons, **MIMOSA aims to develop an accessible, cost/risk optimised multi-recycling strategy of LWR spent fuels in the EU, based primarily on multi-recycling of Pu (and reprocessed Uranium) in LWRs combined with the Cl MSR**, using already available infrastructure in the EU such as the French reprocessing plant in La Hague.

This strategy will also be compared with other multi-recycling scenarios and alternative reprocessing options.



Work programme

MIMOSA focuses more specifically on the demonstration of several key aspects of technical feasibility and performance of Cl MSRs that will contribute to accelerating the deployment of this advanced technology, on Pu and MA conversion, respectively, and on production of valuable isotopes for other applications.

- MSR safety assessment, in particular the qualification of innovative materials, new corrosion monitoring and mitigation methods, control of accidental situation…
- Development of synthesis routes of the chloride fuel salt for use at the industrial scale
- Selection and qualification of optimized fuel salt composition with respect to its thermo-physical properties
- Pyro-chemical processes to recycle Plutonium and minor actinides
- New methods for fission products management (removal of FPs, extraction and purification of the valuable FPs, disposal of FPs)
- Qualification of codes coupling neutronics and thermo-hydraulics

Highlights & expected results

Globally, the MIMOSA project will raise the TRL of several Cl MSR related technologies, processes and materials from 1 or 2 (initial status) to 3 or 4 (final status), depending on topics.

The successful achievement of the MIMOSA objectives will contribute to the development of materials and technologies that can be useful not only for MSRs but also other high temperature, high corrosion applications such as the chemical industry, energy storage, and **pave the way for Cl MSR deployment in Europe**, which could be a game changer in nuclear energy, enabling the closure of the fuel cycle and significant beneficial impacts on the HLW storage footprint.

Duration: June 2022/26 (4 years)

Partners

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