Contribution ID: **507** Type: **ORAL**

1992-2017: 25 years of success story for the Development of Minor Actinides Partitioning Processes

Monday, June 26, 2017 3:10 PM (20 minutes)

In the framework of the successive 1991 and 2006 Waste Management Act, French government supported a very significant R&D program on partitioning and transmutation in fast reactors of minor actinides (MA). This program aimed to study potential solutions for still minimizing the quantity and the hazardousness of final waste, by MA recycling. Indeed, MA recycling can reduce the heat load and the half-life of most of the waste to be buried to a couple of hundred years, overcoming the concerns of the public related to the long-life of the waste.

Over the 20 years of development, different types of strategies were studied, from the early multi-stage DIAMEX-SANEX processes to the most recent innovative SANEX, from the grouped extraction of MA thanks to the GANEX process to the most recent sole Americium recycling thanks to the EXAm process. These developments were supported by a robust and long-standing approach allowing successively to screen the potential extractants, to quantify their extractive properties and develop a relevant chemical model to simulate it and to address their hydrolysis and radiolysis resistance. Finally, all these processes were qualified tested on a few kg of spent nuclear fuel within the Atalante CBP facility. This wide research program allows France to get in hand a flexible portfolio of MA recycling processes that could be implemented after industrial upscaling.

More recently, CEA initiated a demonstration experiment, the so-called integral experiment, which aims to re-irradiate in a Material Testing Reactor some fuel pellet manufactured from recycled UAm. Most recent results on these key experiments will be presented.

Finally, several European Research Projects were funded in parallel by the European Commission and allow studying alternative separation processes. A general overview of this 20 years of successful and innovative research history will be synthesised in this presentation.

Country/Int. Organization

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Session Classification: 4.1 Fuel Cycle Overview

Track Classification: Track 4. Fuel Cycle: Sustainability, Environmental Considerations and Waste Management Issues