

Progress in R&D on Pyrochemical Partitioning Technology in the Czech Republic

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Abstract

Pyrochemical partitioning represents a prominent part of the Czech R&D activity in partitioning and transmutation. The R&D activities in pyrochemistry has been focused exclusively on fluoride technologies as the original intention of the program was motivated by the Molten Salt Reactor system concept with fluoride salts based liquid fuel, the fuel cycle of which is based on pyrochemical fluoride partitioning of spent fuel. At present, the aim of the pyrochemical program is broader, in addition to MSR fuel cycle technology the utilization of the fluoride separation processes within the fuel cycles of LWR or Fast Breeder Reactors is investigated as well.

Two main fluoride partitioning technologies are under development in the Nuclear Research Institute Řež plc. The first technology devoted to the reprocessing of LWR or FBR spent fuel and to the primary processing of MSR transuranium fuel is Fluoride Volatility Method. The second technology under development is Electrochemical separation process from fluoride molten salt media. The electrochemical separation should be mainly used for “on-line” reprocessing of MSR fuel.

R&D on Fluoride Volatility Method is focused to the development and experimental verification of a semi-pilot technology for reprocessing of advanced types of oxide, metallic and dispersed fuels from LWRs or FBRs. The technology is based on direct fluorination of powdered spent fuel with fluorine gas and on subsequent separation of fluorinated products based on the differences in their volatility. The current research work in the area of Fluoride Volatility Method is focused to the experimental program carried out at the semi-technological line called FERDA. The experimental test program has been focused mainly to the study of flame fluorination process.

R&D on electroseparation processes from fluoride molten salt media is focused on the development of suitable electroseparation technique for partitioning of actinides from fission products in the fluoride melt media. Here the emphasis is put also on the specific aspects and requirements of on-line reprocessing technology devoted to MSR systems with thorium – uranium fuel.

The paper summarizes the results achieved in the development of pyrochemical partitioning technologies mentioned above and outlines the future activities in Czech P&T program.