

Protected Plutonium Production by Transmutation of Minor Actinides

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Abstract

“Protected Plutonium Production (P³)” has been proposed to enhance the proliferation resistance of plutonium by the transmutation of Minor Actinides (MAs). The enhancement of the production of ²³⁸Pu by doping the small amount of MAs such as ²³⁷Np or ²⁴¹Am into the uranium fuel in the thermal reactors is very effective to make the process of the nuclear weapon manufacture and maintenance technologically difficult because of high decay heat and large number of spontaneous fission neutron.

The theoretical prediction of the P³ mechanism was demonstrated by the irradiation tests of Np in Experimental Fast Reactor Joyo (JAEA) and Np-U Samples in Advanced Thermal Reactor (INL). The experimental results agreed very well with theoretical predictions.

Instead of the geological disposal or just the burning of MAs by the fission reaction, they should be treated as valuable fertile materials to enhance the proliferation resistance of plutonium in the reactors for peace and sustainable prosperity in future.