

Depletion calculations in an ads core using ACTRAN code

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Most of the radioactivity of spent fuel after service is due primarily to the radioisotopes generated by fission, despite the activity levels of the fission products rapidly decrease because of their short half-lived. On the other hand, a small amount of transuranic waste is generated by successive neutron capture in uranium, most of them α -emitters, some with high toxicities, in comparison with fission products, which are β - and γ -emitters. The high-level wastes are stored in facilities above ground or shallow repositories, in close connection with its nuclear power plant, which can take almost 10^6 years before the radiotoxicity became the order of the background. While the disposal issue is not urgent from a technical viewpoint, it is recognized that extended storage in the facilities is not acceptable since these ones cannot provide sufficient isolation in the long term and neither is it ethical to leave the waste problem to future generations. A technique to diminish this time is to transmute these long-lived elements into short-lived elements. The approach aims to use an Accelerator Driven System (ADS), a sub-critical arrangement which uses a Spallation Neutron Source (SNS), after the separation of the minor actinides and the long-lived fission products (LLFP), to convert them to short-lived isotopes. Since most of the facilities for transmutation require the use of some MAs as fertile-free fuel, like $(Pu_{0.4}, Am_{0.5}, Cm_{0.1})O_{2-x} - Mo$, this paper shows some burnup calculations of a typical ADS fuel, using ACTRAN Code [1]. The code solves, numerically, the Depletion Equations, without none simplification in the chain decays.

The code results confirmed the efficiency of ADS in transmuting some of Minor Actinides [2]. The Figure 1 shows a result using ACTRAN code.

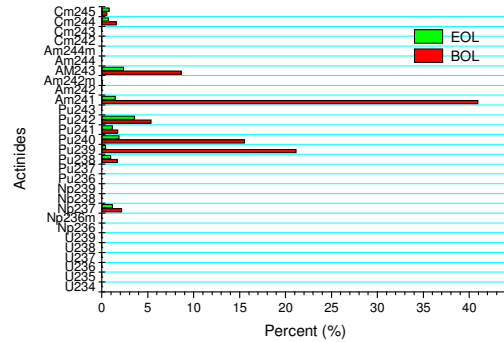


Figure 1. Fuel composition from ACTRAN

References

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- [2] R. S., Santos, "Steam Turbine: Alternative Emergency Drive for the Secure Removal of Residual Heat from the Core of Light Water Reactors in Ultimate Emergency Situation," The Second International Conference on Physics and Technology of Reactors and Applications – PHYTRA2, Fez, Morocco (2011).

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