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Feasibility of Burning Wave Fast Reactor Concept with Rotational Fuel Shuffling

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Burning wave fast reactor is very attractive concept. It is possible to achieve very high burnup using natural uranium or depleted uranium as fuel. It does not need fuel reprocessing facility. This kind of reactors can be categorized into two groups. One is the reactor whose burning wave is moving for radial direction, for example, Traveling Wave Reactor. The other is that whose burning wave is moving for axial direction, for example CANDLE burning reactor. The advantage of the reactor concept with radial direction wave movement is that fuel shuffling is easy, but high burnup fuels will exist in high neutron importance region at the center of core. It can be a disadvantage from the view point of neutron economy. The advantage and disadvantage of reactor concept with axial direction movement wave is vice versa. One of the ideas to solve the problems is the concept of shuffling of fuel pins or fuel elements rotationally so that high burnup fuel can be located in low neutron importance region. In the concept, fuel shuffling, load and reload are easy. The purpose of study is to show the possibility to apply for the concept of rotational fuel shuffling in burning wave fast reactor concept. Preliminary analysis was performed using continuous energy Monte Carlo code MVP2.0, JENDL-4.0 nuclear data library, and newly developed additional programs to simulate movement of fuel elements by the shuffling. The results of preliminary analysis showed the stable neutron flux profile can be existed in the core if the shuffling procedure is proper. The detail of shuffling procedure and the burnup characteristics will be presented in the conference.

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