

## Experiment and Analysis of Innovative Water Reactor for Flexible Fuel Cycle in FCA using JENDL-3.3

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Innovative Water Reactor for Flexible fuel cycle (FLWR) is proposed as a new reactor concept for the next generation by JAERI. The FLWR is aimed at high breeding ratio and high burn up with the use of highly enriched MOX fuel in tight lattice. To obtain experimental data and to evaluate the prediction accuracy for the core characteristics in the design study of the FLWR, a program of critical experiments was planned at the fast critical facility, FCA. These experiments were carried out using a series of mock-up cores composed of a combination of uranium and plutonium fuel plates to simulate MOX fuel in tight lattices varying the void fraction of the moderator. Three mockup cores with different void fractions of the moderator (45%, 65% and 95%) were constructed to obtain experimental data in wide range to cover the neutron spectrum of the FLWR.

The FCA FLWR mockup core, XXII-1 series core, is a coupled system of a central test zone and a driver zone. The test zone is approximately represented by a rectangular prism. It is surrounded by the enriched uranium driver zone and two blanket zones; an inner blanket zone containing depleted uranium dioxide and sodium plates, and an outer blanket zone containing only depleted uranium metal. The test zone is composed of a combination of uranium/plutonium fuel plates and moderator material (foamy polystyrene) plates to simulate the neutron energy spectrum of FLWR. The principal cell averaged parameters of the test zone are shown in **Table 1**. Major items of the experiment are criticality, reaction rate ratio of the  $^{238}\text{U}$  capture to the  $^{239}\text{Pu}$  fission (C28/F49), moderator void reactivity worth and Doppler effect.

Since the nuclear reactions are dominantly occurred in the intermediate neutron energy range, two different conventional deterministic calculation systems were used to analyze the experiment; the SRAC code system and a standard calculation code system for a fast reactor. In these calculations, the JENDL-3.3 library was used.

**Table 1** Cell averaged parameters of the test zone in the FCA FLWR mockup cores

Core Name	XXII-1(45V)	XXII-1(65V)	XXII-1(95V)
Enrichment (%)	15.8	15.8	15.8
Vm/Vf *	0.6	0.6	0.6
Void fraction (%)	45	65	95
H/HM **	0.81	0.52	0.091

\* Volume fraction of moderator to fuel plates in a cell

\*\* Atomic number ratio between Hydrogen and Heavy Metal nuclide in a cell