Irradiation Experiments on ^{237}Np and ^{241}Am by Accelerator-Driven System at Kyoto University Critical Assembly

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At the Kyoto University Critical Assembly (KUCA), first injection [1] of high-energy neutrons generated by interaction of 100 MeV protons and a heavy nuclide target was accomplished in a solid-moderated core (A-core), on March, 2009, and feasibility studies on ADS have been engaged with the use of a pulsed-neutron generator (14 MeV neutrons), in addition to 100 MeV proton accelerator. Besides neutron characteristics on ADS at a subcritical state, as preliminary study [2] on nuclear transmutation of minor actinide (MA), basic principles of nuclear transmutation of MA was experimentally confirmed in the KUCA A-core at a critical state. Additionally, numerical results (MCNP6.1 with ENDF/B-VII.1) of fission and capture reaction rates of MA accurately compared with experimental ones. On the basis of preliminary analyses of MA in the critical state, nuclear transmutation of MA by ADS at a subcritical state was attempted to be conducted in the KUCA A-core by injection of high-energy neutrons generated with interactions of 100 MeV protons and lead-bismuth target. On 14th Feb., 2019, first nuclear transmutation [3] of ^{237}Np and ^{241}Am by ADS was experimentally demonstrated in the A-core at the subcritical state, including the fission reactions of ^{237}Np and ^{241}Am, and the capture reactions of ^{237}Np. Furthermore, for the irradiation experiments of MA by ADS, the Monte Carlo calculations were performed for the fission and capture reaction rates of MA, and the accuracy of experimental analyses was found to be significantly validated through the comparison between experimental and numerical results.

References

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