

Numerical Investigation of Th-229 Production in an Accelerator Driven System Reactor

Abstract

The expected increase in radionuclide demand for treatment of various tumor diseases has led to the investigation of alternative production routes to provide sufficient amount of medical isotopes[1]. In Targeted Alpha Therapy (TAT), there is a present and future need for the Ac-225 and Bi-213, as the most promising alpha emitting isotopes, one of the limited ways to provide these radioisotopes is by production of Th-229 in reactor route[2][3]. The present study conducted to investigate the production of Th-229 to expand the availability of Ac-225 and Bi-213 in innovative nuclear reactor concept like Accelerator Driven System reactor (ADS)[4], which is a subcritical reactor and currently in development that predict to play an important role in the transmutation process of heavy elements and isotopes production. The possibility of producing Th-229 from neutron transmutation of Ra-226 are numerically investigated for simple model of ADS reactor consist of two zones, inner region with fast neutron spectra and outer region with thermal neutron spectra, and the subcritical core coupled with external neutron source. The calculations of transmutation behavior and mass ratio for the produced isotopes are conducted by using Monte Carlo N-particle Transport (MCNPX) code.

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References

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