Effects of Buffer Thickness on ATW Blanket Performances

Won Sik Yang
Chosun University
375 Seosuk-dong, Dong-gu, Kwangju, Korea, 501-759

Abstract

This paper presents the preliminary results of target and buffer design studies for a lead-bismuth eutectic (LBE) cooled accelerator transmutation of waste (ATW) system, aimed at maximizing the source importance while simultaneously reducing the irradiation damage to fuel. Using an 840 MWt LBE cooled ATW design, the effects of buffer thickness on the blanket performances have been studied. Varying the buffer thickness for a given blanket configuration, system performances have been estimated by a series of calculations using MCNPX and REBUS-3 codes. The effects of source importance change are studied by investigating the low-energy (< 20 MeV) neutron source distribution and the equilibrium cycle blanket performance parameters such as fuel inventory, discharge burnup, burnup reactivity loss, and peak fast fluence. As the irradiation damage to fuel, the displacements per atom (dpa), hydrogen production, and helium production rates are evaluated at the buffer and blanket interface where the peak fast fluence occurs. The results show that the damage rates and the source importance increase monotonically as the buffer thickness decreases. Based on a compromise between the competing objectives of increasing the source importance and reducing the damage rates, a buffer thickness of around 20 cm appears to be reasonable.