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ABSTRACT

A parameter study was made of some of the nuclear characteristics the HRT would have if the core and blanket were operated at different temperatures. The power density in the fuel solution at the inner surface of the core tank was found to be affected very little by the temperature distribution. However, the thermal flux at the core-tank wall increased when the blanket temperature was reduced (a consequence of the reduced critical concentration).

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OPERATION OF THE HRT WITH DIFFERENT CORE AND BLANKET TEMPERATURES

M. W. Rosenthal and R. Chalkley

Some of the characteristics the HRT would have if the core and blanket were operated at different temperatures have been estimated using a two-group, two-region routine for the Oracle. Critical concentrations, fluxes, and power densities were obtained for various ratios of fuel concentration in the blanket to that in the core. Core temperatures of 250 and 280°C were studied, and blanket temperatures ranged from 200 to 280°C. The fuel was U^{235} and the moderator was 99.8% D_2O .

The effects of operation with different temperature combinations on the critical concentration and fraction power generated in the core are shown in Fig. 1. The critical concentrations in the core are normalized to those values associated with operation of core and blanket at 280°C. It should be noted that the power distribution applies only to the fission energy which is absorbed near the point of fissioning. No allowance is made for the distribution of energy deposited by prompt, decay, and capture gamma rays.

As shown in Fig. 2, the power density in the fuel solution at the inner surface of the core tank was affected very little by the temperature distribution (for the same total power). However, the thermal flux at the core-tank wall increased by about 30% when the core temperature was lowered from 280 to 250°C in combination with lowering of the blanket temperature from 280 to 200°C. This flux change was a consequence of the reduced critical concentration.

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