RADIATION CHARACTERISTICS OF FUEL OF THE IV GENERATION NUCLEAR INNOVATION SYSTEM

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Researches in the field of physics of nuclear fuel of new generation are being carried out at present at National research Tomsk polytechnic university [1-3]. The fuel being developed is a graphite matrix with micro encapsulated fuel (microfuel) of spherical shape in it. The main technological application of these re-searches is creation of low-power high temperature gas-cooled thorium reactor unit [1]. The researchers are of great significance and are generally paid much attention to.

In the present paper a calculated analysis of different configurations of thorium reactor core loading is described. Neutron-physical researches and fuel isotopic composition calculation were made. Alpha-emitters, sources of neutron and photon radiation were analyzed. A calculation instrument which allows evaluating radiation characteristics of nuclear fuel at the reactor designing stage was developed. It also makes it possible to reconsider usual procedures of handling new and irradiated nuclear fuel in a nuclear fuel cycle of new generation [3].

The main attention in the research was paid to the calculation of neutron yield and spectrum formed as a result of (alpha, n)-reactions on light nuclei of microfuel, as the concentration of various alpha-emitters resulting from irradiation is directly dependent on the fuel burn-up, while the concentration of (alpha, n)-neutrons depends on the configuration of microfuel, graphite matrix, concentration of light elements, and modifies the pattern of neutron diffusion flux.

The researched were performed to create an effective calculation instrument used for initial evaluation of radiation characteristics of nuclear fuel in a nuclear fuel cycle of new generation.

An analytical model and verified calculation codes of the programs WIMS-D5B, SCALE 6.0, SOURCES-4C and SRIM-2013 were used.

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