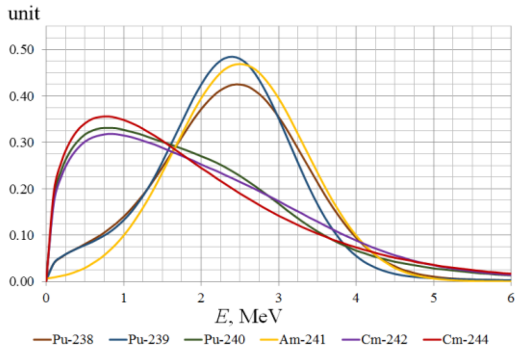
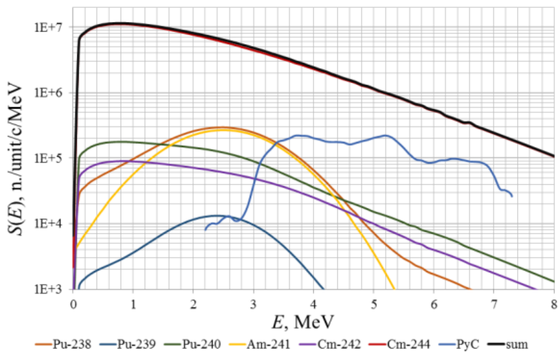
INTERATION SOLUTION METHOD EFFECTIVENESS OF CONDITIONAL CRITICAL NEUTRON-TRANSPORT TASK IN SUBCRITICAL SYSTEMS

O.A. Ukrainets, S.V. Bedenko, A.I. Zor'kin
National research Tomsk polytechnic university,
Russia, Tomsk, Lenin av., 30, 634050
E-mail: lesyaukrainets@gmail.com

The study of the fuel block radiation and neutron-physical characteristics of the reactor unit of the 4th generation was undertaken [1]. Fuel and radiation sources nuclide composition was calculated using the verified calculation code of MCU5 program. The neutron yield formed in (α,*x*n) reactions and at spontaneous fission was estimated. Spectral and standard neutron distribution was obtained using approximation of a wide list of calculation and experimental data. The distribution functions were arranged in a group and uninterrupted form and used for solving the conditional critical task of the neutron-transport in the 28 group approximation (see Fig.1). The result of the transport equation solution was spectral and integral neutron-physical characteristics of the fuel block.



Standard neutron distribution: (α,n)+sf



Spectral neutron distribution: (α,n)+sf

Figure 1. Spectral and standard neutron distribution

MCU program and multigroup approach sharing made it possible to decrease the principle simulation stage connected with the transport equation solution considerably and to increase the solution accuracy. The study was carried out for the purpose of developing procedures and regulations of irradiated fuel handling in a nuclear fuel cycle of the new generation.

Spectral and integral neutron-physical characteristics of the system were obtained and the resulting calculation data was verified. The applied approach is considered economical from the point of view of computational cost (as the value of neutron flux density fractions agree at the 3rd iteration) and expenditures connected with nuclear data bank storage. This approach can be used in tasks of nuclear and radiation safety.

It will allow researching constructional elements radiochemical and corrosion resistance of the package for nuclear materials transporting.

REFERENCE

1. I. Shamanin, S. Bedenko, Y. Chertkov, I. Gubaydulin, Gas-Cooled Thorium Reactor with Fuel Block of the Unified Design, Advances in Materials Science and Engineering, vol. 2015, Article ID 392721, 8 pages, doi:10.1155/2015/392721.