THE ANALYSIS OF SCIENTIFIC STUDIES WHICH DIRECTS AT IMPROVING OF FUEL AND NEUTRON-ABSORBING ELEMENTS OF THE NUCLEAR REACTOR CORE

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Currently, many global scientific studies are directed at improving the properties of fuel and neutron-absorbing elements of the nuclear reactor core. The basis of these various studies is a series of physical laboratory experiments to evaluate the relevant properties of nuclear construction materials, fuel rods and absorbing rods: thermophysical characteristics, indicators of corrosion resistance, radiation resistance, thermal resistance, etc. In [1], the results of studies of thermophysical properties of fuel rod cladding made of Zr1%Nb alloy with different coatings are presented. The authors showed that covering the cladding with CrN material increases its reliability in a loss-of-coolant accident (LOCA). Research on the influence of thermochemical processing parameters and regimes of zirconium alloys of fuel rod cladding showed that processing in a gas environment increases the shell's corrosion resistance [2]. In [3], the authors analyzed the influence of the uncertainty of the physical experiment results on the properties evaluation and efficiency of the regulating neutron-absorbing rods of PWR reactors. The authors consider the production tolerances in the absorbing rod production and the limitation of the assessment results of these properties to be one of the uncertainty sources. In statistical analyses, typically a large number of simulations must be run. This increases the probability of failure of the simulation program due to non-convergence of the calculation, the authors of paper [4] emphasize. This results in missing data, and this could prevent the use of order statistics which are based on the sorting of observations. With missing data, the real order of the observations is unknown. This work suggests a suitable data treatment method to overcome this problem. The fission gas emission process for instant release fraction estimation is considered. A method for the determination of upper tolerance intervals for fuel assembly summary statistics, such as the mean, was developed. The analysis of the results of scientific research by the listed Ukrainian and foreign authors shows the relevance of the properties improving and optimizing task of heat-emitting and neutron-absorbing elements of the NPP reactors cores for Ukrainian nuclear technologies.

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