REQUIREMENTS FOR THE MATERIALS OF REACTORS OF THE NEW GENERATION

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For nuclear reactors with different coolants, there are many requirements, which is reflected in the selection of similar materials or classes of materials for different types of reactors. When developing nuclear power plants of the new generation, the task is not only to maximally increase the nuclear safety of reactors and improve economic indicators, but also to increase their environmental safety due to the use of structural materials of elements of active zones with a relatively rapid decline in activity. Therefore, structural materials should not only be heat-resistant, thermocyclically strong, radiation-resistant, but also satisfy the requirement of low activation or rapid decline of the given activity. The use of low-activated steel for the manufacture of the reactor housing and internal equipment allows for a 5-fold reduction in the dose load on service personnel and a 20-fold reduction in the characteristic decay time of the given activity compared to the materials already in use. It is known that the indicated activity of alloys depends on the level of impurities in steels, as well as the presence of alloying elements that make a large contribution to the value of the indicated activity. Thus, if possible, alloys should not contain or contain in limited quantities such elements as niobium, molybdenum, nickel, copper, silver, cobalt, etc. Therefore, these elements should be excluded or replaced by others. The high level of content of impurity elements and gases in steels and alloys significantly reduces their mechanical, corrosion and radiation properties, and therefore limits their use in operating reactors and in reactors being designed. The use of high-purity metals as initial components of new structural materials and the development or optimization of their smelting technologies should ensure the required level of characteristics and properties of products made from them.