THE RESULTS OF THE TESTS OF PROTECTION BLOCKS INSIDE THE VACUUM OF THE PORT PLUG OF ITER

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One of the functions of the diagnostic port plug-ins of the tokamak ITER is neutron protection of the equipment installed in the port, as well as reducing the radiation background in the area of the reactor elements that require access for maintenance personnel. According to the ITER specification, the radiation background near the vacuum flange of the diagnostic port should be less than 100 mSv/h after 106 s, which requires attenuation of the primary neutron flux from the plasma by more than 107 times.

Properties of ceramics based on boron carbide significantly depend on the technology of its manufacture. In this regard, in order to make a decision on the possibility of using a certain type of ceramics as a neutron protection material in ITER port plugs, it is necessary to measure the elemental composition and physical properties of ceramics – thermal conductivity and outgassing in vacuum.

Studies on ceramics based on boron carbide, manufactured at Russian enterprises were conducted. Samples of ceramics were submitted by Virial (St. Petersburg), NEVZ-Ceramics (Novosibirsk), Bifors (Tver). Hot-pressed, reaction-sintered, sintered boron carbide as well as initial powder with different grain size were investigated.

Outgassing tests, as well as tests for purity according to ITER Vacuum Handbook, were performed. For the Equatorial port-plug № 11, the estimation of total gas release was made:
1·10–5 Pa· m3/s for hot-pressed boron carbide.

The first results on the activation analysis of ceramics by neutrons generated by the tandem accelerator VITA were obtained.