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PROPERTIES OF BORON CARBIDE CERAMICS SERIALLY SUPPLIED TO ITER DIAGNOSTIC PORTS FOR NEUTRON SHIELDING ^{*)}

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The use of boron carbide ceramics has been proposed to provide effective in-vessel neutron shielding in the ports of the ITER experimental fusion reactor under construction in France. Under severe restrictions on the mass of the ports and the required level of radiation shielding, boron carbide ceramics have the advantage of low density and effective absorption of both fast and slow neutrons.

Different types of B₄C ceramics from several Russian manufacturers were tested to confirm that the ceramics meet the stringent requirements of the ITER Organization for materials in the reactor vacuum chamber.

Activation tests of ceramics were performed using both slow and fast neutrons, which were generated at the tandem gas pedal for boron-neutron-capture cancer therapy at the BINP [1]. The ceramics were also subjected to long-term exposure to fast neutrons with a fluence of 10¹⁴ neutrons/cm² to study the degradation of mechanical properties and demonstrate resistance to cracking.

Based on the test results, it was concluded that the sintered boron carbide ceramics meet all ITER requirements and its serial production was started at Virial Ltd.

Ceramics production should comply with the specification for ceramics production ITER_D_457TBH and drawings ITER_D_X2GWTZ approved by the ITER Organization.

The tests of properties of boron carbide ceramics serially supplied for equatorial port No. 11 and upper port No. 7 were carried out, which showed its compliance with the requirements.

Reference

- [1]. A. Shoshin, A. Burdakov, M. Ivantsivskiy, et al., Test results of boron carbide ceramics for ITER port protection, Fusion Engineering and Design, 168 (2021).

^{*)} [abstracts of this report in Russian](#)