

OXIDATIVE RESISTANCE OF IRRADIATED GRAPHITE COATED WITH SILICON CARBIDE

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The main characteristics of structural graphite material are stability of linear dimensions, strength, creep, elastic modulus, thermal expansion and thermal conductivity, as well as oxidation resistance [1].

Damage of nuclear reactor materials as a result of its oxidation is one of important items of nuclear safety in case of an accident. In particular, graphite materials are used in internal parts of high-temperature gas-cooled reactor (HTGR) due to its excellent neutron, thermal and mechanical properties. Graphite is used as structural materials in fuel elements, playing also parts of moderator and reflector. In case of an accident with ingress of water or air, oxidation of graphite material would be one of the most serious problems. To avoid this, it is assumed to use graphite covered with oxidation-resistant coating on a base of graphite, coated with silicon carbide (SiC).

At INP (Kazakhstan), jointly with JAEA (Japan), a study of resistance to oxidation of graphite, coated with SiC, after its irradiation in the WWR-K reactor core. Samples of graphite, coated with SiC from four manufacturers from Japan were irradiated in the WWR-K reactor for 200 days. The fast neutron fluency ($E_n > 0.18$ MeV) comprised $1.1 \cdot 10^{25} \text{ m}^{-2}$. After irradiation, the specimens passed through the oxidation test in environment of helium with oxygen (20%) at 1200°C. In course of the test, release of carbon dioxide (CO₂) and concentration of oxygen (O₂) in swept gas were monitored. Only the sample from manufacturer X was found to be resistant to oxidation, there were no detected release of CO₂. Three others oxidized in course of the test.

REFERENCES

- [1] Voevodin V.N., Gribanov Ju.A., Gurin V.A., Gurin I.V., Gujda V.V. // VANT. – 2015. – №2(96). – p. 52 – 64.