DOI: 10.34854/ICPAF.52.2025.1.1.254

MANUFACTURING OF DNFM ELEMENTS IN THE BINP SB RAS *)

¹<u>Gavrilenko D.E.</u>, ^{1,3}Burdakov A.V., ¹Ivantsivsky M.V., ²Kashchuk Yu.A., ²Obudovsky S.Yu., ²Stepanov S.B., ²Kormilitsyn T.M., ¹Steshov A.G., ¹Shiyankov S.V., ¹Sharafeeva S.R., ^{1,3,4}Shoshin A.A., ¹Seryomin V.V., ¹Taskaev A.S., ¹Seleznev P.A.

¹Budker Institute of Nuclear Physics SB RAS, Novosibirsk, Russia,
²Institution "Project Center ITER", Moscow, Russia.
³Novosibirsk State Technical University, Novosibirsk, Russia,
⁴Novosibirsk State University, Novosibirsk, Russia

As part of the work on the ITER project at the BINP SB RAS, in addition to working out the production cycle of manufacturing and testing diagnostics, additional studies were carried out on the strength characteristics of structural materials of DNFM fasteners. Fastener samples made of alloy XH45MBTIOEP-ИД (EP718-ИД) (TV 14-1-3905-85) were tested for tensile strength at room and elevated temperatures (350 °C), then samples were tested for low-cycle fatigue. According to the test results, the main mechanical characteristics of the material were confirmed, which fully meet the requirements of operation of the structure at high electromagnetic loads.

In addition, in order to study the possibility of using aluminum oxide ceramics Al2O3 as insulating gaskets between the DMNP body and the ITER vacuum chamber under conditions of temperature pitching, mechanical and thermocyclic tests of samples of insulating elements were carried out.



Figure 1 – Thermocyclic test facility



Figure 2 – Test assemblies placed in the thermocyclic furnace

As part of the thermal cycling procedure, 10 heating-cooling cycles were carried out in the temperature range from 30 °C to 230 °C with a heating rate of ~ 3.1 ° C/min. Based on the test results, a number of recommendations were made for the design of insulators. The roughness of the surface of the DNFM attachment in the places of adhesion of ceramic insulators at the level of Ra 1.6.

Mechanical properties of such materials as boron carbide (B4C), aluminum nitride (AlN), etc. research is ongoing. The results obtained during the tests confirmed the correctness of the selected engineering solutions.

Based on the data obtained, the design and technological documentation of the project was adjusted.

^{*)} abstracts of this report in Russian