EXPERIMENTAL STUDIES OF THE DISTINCTIVE FEATURES OF POWER RELEASE FROM PLASMA ONTO LITHIUM COLLECTORS IN THE T-11M TOKAMAK CONSIDERED IN THE FRAMEWORK OF THE MODEL OF CLOSED LITHIUM CIRCULATION CIRCUIT

1Shcherbak A.N., 1Vasina Ya.A., 2Vertkov A.V., 2Glazuk J.V., Dzhurik A.S., 2Zharkov M.Yu., 1Lazarev V.B., 2Lyublinski I.E., 1Mirnov S.V., 1Prishvitsyn A.S.

1Troitsk Institute for Innovation and Fusion Research, Troitsk, Moscow, Russia,   
 [shcherbak@triniti.ru](mailto:shcherbak@triniti.ru)  
1JSC "Red Star", Moscow, Russia

One of the most promising ways to protect the first wall of a tokamak-reactor, in particular, a fusion neutron source (FNS) on tokamak’s basis [1], is the formation of a closed lithium circulation circuit in a tokamak plasma [2]. Over the past years, in the framework of the lithium closed loop model the emitter-collector scheme has been successfully used on the T-11M tokamak. In this scheme a vertical lithium limiter based on a capillary-porous system (CPS) [3] acts as a lithium emitter, and two longitudinal lithium limiters also based on CPS act as a lithium collectors.

Earlier, in the framework of using such a scheme, it was possible to collect and remove up to 80% of lithium injected during plasma discharges outside the vacuum chamber without violating vacuum conditions [4]. The opportunity to remove heat loads coming to plasma facing components due to non-coronal radiation of lithium is another advantage of lithium for ensuring stationary work. Finally, in early experiments on SPRUT-4 and QSPA installations, it was shown that elements with a CPS-based lithium can withstand sustained thermal loads up to 25 MW/m2 and short-term loads up to 50 MW/m2 without damage [3].

In the proposed work, we continued to investigate the efficiency of the lithium coating as a protection of plasma facing components under T-11M tokamak conditions. The analysis of the power on the lithium collector (longitudinal lithium limiter) during plasma exposure was also carried out. The screening effect of lithium flows entering the peripheral plasma from a lithium emitter has been studied.

References

1. Mirnov S.V. et al. Nuclear Fusion 55 (2015) 123015.
2. Mirnov S.V. et al. J. Nucl. Mater. 390–391 (2009) 876.
3. Evtikhin V.A. et al. Plasma Phys. Controlled Fusion 44 (2002) 95.
4. Mirnov S.V. et al. Nucl. Fusion 55 (2015) 123015.