Observation of THE vapor-shielding eFFECT ON A LITHIUM LIMITER IN T-11M TOKAMAK DURING A DISCHARGE WITH A LOW plasma DENSITY [[1]](#footnote-1)\*)

DOI: 10.34854/ICPAF.2020.47.1.022

Prishvitsyn A., Dzhurik A., Lazarev V., Mirnov S.

SRC RF TRINITI, 108840, Russia, Moscow, Troitsk, Pushkovykh st., 12; ASPrishvitsyn@mephi.ru

Lithium is the most promising liquid metal, considered as potential for plasma-facing elements. It was experimentally shown, that the use of lithium in tokamaks increases plasma confinement time, decreases the amount of impurities in the plasma, and decreases hydrogen recycling on the plasma facing components [1].

 Experiments on the tokamak T-11M are devoted to the development of a closed-loop lithium circulation system. Within the framework of this program, it is necessary to investigate the thermal loads goes to the plasma facing components of vacuum chamber, in particular, the longitudinal limiters - collectors of lithium [2-6].

The T-11M tokamak is equipped with two high-speed cameras Baumer HXG20C operating in the visible range. It allows to record processes on two limiters or to take pictures of one limiter from two angles during the tokamak pulse. There are various light filters used in experiments: LiI (671 nm.), LiII (549 nm) and Hα (656 nm). Also, the T-11M diagnostics is equipped with two infrared camera Infratec VarioCam HD Head 680 and Infratec VarioCam HD Head 880, operating in the wavelength range of 7.5 - 14 microns. The launch of all cameras is synchronized.

 The observation of two longitudinal collectors in tokamak T-11M is carried out simultaneously in the visible and IR wavelength ranges. Cameras operating in the infrared range are used for recording the temperature distribution on the surface of lithium collectors. This allow to determine the distribution of heat load on the collectors surfaces. In the shot #49068 (the shot with low plasma density) we observed a vapor-shielding effect on longitudinal limiter. Data analysis let us to understand behavior of the lithium limiters system in various tokamak regimes.

The work carried out at NRNU MEPhI to determine the temperature dependence of the lithium and CPS with lithium emissivity (grayness coefficient) made it possible to increase the accuracy of the data obtained from IR cameras.

References

1. Tabares F.L. et al. Conference Report on the 4rd International Symposium on Lithium Applications // Nucl. Fusion. IOP Publishing, 2016. Vol. 56, № 12.
2. Mirnov S. V. Experiments at the T-11M device in support of the tokamak concept with closed Li cycle // Fusion Eng. Des. Elsevier B.V., 2010. Vol. 85, № 6. P. 919–923.
3. Mirnov S. V et al. LITHIUM EXPERIMENT IN TOKAMAK T-11M AND CONCEPT OF LIMITER TOKAMAK-REACTOR. 2006. № 12. P. 41–43.
4. Mirnov S. V et al. Experimental test of the system of vertical and longitudinal lithium limiters on T-11M tokamak as a prototype of plasma facing components of a steady-state fusion neutron source // Nucl. Fusion. SSC RF TRINITI, Troitsk Dep., Moscow, Russian Federation: Institute of Physics Publishing, 2015. Vol. 55, № 12.
5. Mirnov S.V. et al. Recent lithium experiments in tokamak T-11M // J. Nucl. Mater. 2013. Vol. 438. P. S224–S228.
6. Lazarev V.B. et al. Development of fast video recording of plasma interaction with a lithium limiter on T-11M tokamak // Fusion Eng. Des. Elsevier B.V., 2016. P. 1–5.
1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/XLVII/Mu/ru/AE-Prishvitsyn.docx) [↑](#footnote-ref-1)