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EX/P5-25: Recent achievements of the T-11M lithium program

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The main subject of T-11M tokamak lithium research is solution of the technological problems, connected with creation of the plasma facing components (PFC) of a steady-state tokamak reactor, which can be used as a fusion neutron source (FNS). The idea of liquid lithium as material of steady-state limiter was tested in early T-11M experiments by using of the lithium capillary porous system (CPS). The recent lithium activity in tokamak T-11M had three main directions: investigations of long-term interaction of a lithium limiter with hydrogen plasma, investigations of different schemes of lithium collection and development of new kind CPS limiters, namely a vertical rail limiter on the low B-field side. For the long-term investigations the T-11M tokamak was transformed into the test stand with steady-state deuterium glow discharge (DGD) for exposing of PFC. Series of alternated DGD exposures and ordinary shots of T-11M operation were used for test of lithium emission of limiter surface and evolution of deuterium recycling after long-term deuterium plasma interaction. The measurements showed that the effect of "lithium poisoning by deuterium bombardment" is small enough and the Li-limiter can be used successfully during the long-term tokamak operations as a Li-emitter. For the investigation of different schemes of lithium collection the additional ring R limiter-collector in the shadow of the main rail limiter was placed in the T-11M vessel. The combination of the results of this experiment with measurements of lithium distribution in the limiter SOL by the method of recombination target allowed an estimation of absolute values of the lithium flux into plasma column from the hot zone of the rail limiter during an ordinary T-11M discharge. This estimation and measurements of lithium deposition on the cold (lateral) sides of T-11M limiters (R+rail) allowed us to reconstruct the lithium flux distributions close to the plasma boundary and first wall. The vertical CPS limiter was designed for increasing of the circulating part of lithium emission. This limiter was installed and successfully tested in the T-11M during operating modes. It allowed the twice increasing of the "cold" collector area as compared to the previous rail limiter. The new vertical lithium limiter allowed us to find the ohmic limiter H-mode with plasma density increase up to Greenwald limit.

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