

## P5.1037 Initial studies of liquid lithium divertor operation in T-15

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See full abstract here <http://ocs.ciemat.es/EPS2019ABS/pdf/P5.1037.pdf>

The power and particle exhaust are among the key problems to be solved for successful operation of ITER and DEMO [1]. The conventional solid plasma-facing component (PFC) solution suffers from numerous drawbacks such as material erosion and degradation under severe power, charged particle and neutron fluxes, possible damage caused by transient events such as Type I ELMs and disruptions. An alternative PFC concept involves using liquid metal (LM) as the divertor target material combined with the tungsten first wall [1]. Among the LM options considered lithium is the most promising one due to its low  $Z$ , gettering capabilities and overall positive influence on the plasma discharge. However, a high sputtering yield of the liquid lithium PFC combined with intense evaporation limit the range of the surface temperature over which it can be used without producing significant core plasma dilution, unless specific divertor designs such as the lithium vapour box [2] are implemented. In the present study we investigate the regimes of the capillary porous structure (CPS) based liquid lithium divertor operation in the T-15 tokamak, using the SOLPS4.3 2D transport code. The simulation setup is close to the one used in [3]. Two possible cases are considered: i) both target plates are made of the actively cooled CPS filled with liquid lithium; ii) only the outer target is, whereas the inner one is made of tungsten. The local surface temperature of the CPS targets is assumed to depend linearly on the heat flux (i.e. 2D effects are neglected), the proportionality factor is defined via 3D finite element modeling and verified experimentally. Various values of the power fluxes from the core region to the edge, the hydrogen fueling rates and the recycling conditions at the surface of PFCs are considered. Since lithium is a relatively inefficient radiator, injection of radiating impurity (neon) for additional heat flux dissipation is also considered. The operational window of the parameters varied is defined, where both the target heat loads are manageable and the lithium influx into the core plasma is acceptable.

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2. Goldston R.J., Myers R., Schwartz J. Phys. Scr. 2016. Vol. T167, P. 014017.
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