

Effects of Lithium Coating of Chamber Wall on the STOR-M Tokamak Discharges

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In a recent experimental campaign in the STOR-M tokamak ($R/a = 0.46/0.12$ cm, $B_t = 0.65$ T, $I_p = 22$ kA), approximately 100 mg of lithium per load has been evaporated from a heated lithium reservoir and coated on the stainless-steel inner wall to study its effects on the tokamak discharge. The evaporators were designed, developed and supplied by General Fusion Inc.. Although four evaporators are available, only one evaporator has been used at present time. Coating of lithium on the surface visible by the evaporator through line-of-sight is expected and rest of the surface may be coated during the discharge through spattering and redistribution of coated lithium due to plasma-wall interaction. It has been found that the partial pressure of impurities such as H₂O, CO and CO₂ reduces significantly immediately after coating, possibly due to gettering effect of lithium coating. During the discharge, the total pressure is also reduced, indicating reduced recycling of gas from the wall. Line emission intensity of selected impurity ions (CIII, OV and CVI) clearly reduces. Correspondingly, the peak plasma current increases by 20% and discharge duration increases significantly. The line averaged electron density reduces by more than 50% due to reduced fuel recycling. The loop voltage reduces by a proximate 1/3 due to reduced impurity. An increase in hard x-ray radiation has also been observed, suggesting an enhanced generation of supra-thermal runaway electrons at lowered electron density. The density reduction can be restored by refuelling via compact torus injection.

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