

Estimation of Impurity Release from Planar Liquid Surface in Plasma

A liquid plasma facing surface, e.g. made of lithium, has been investigated its benefit to fusion plasma operations in past several years. Notably, it has been observed that such a surface placed too deep from a tokamak wall leads to heavy impurity release. Subsequently, the confined plasma cannot tolerate the excessive impurity inventory, and this results in disruption achieving by radiation loss.

The study is to theoretically estimate how much surface material loses from a general planar liquid surface with respect to plasma parameters, i.e. density and temperature, which are generally govern charging on the surface. The influx plasma particles directly and indirectly exert forces on the surface. As a result, the net pressure by the forces control evaporation rate. Furthermore, during the bombardment, the momentum transfer between plasma particles and liquid material atoms/molecules leads to sputtering.

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Track Classification: Plasma Fusion and Technology