
Study on plasma condition for high neutralization efficiency of negative ion beam

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Neutral beam injectors play an important role in heating and driving a current of fusion plasma. In order to obtain neutral beams injected into the fusion plasma as high energy beams, a method of neutralizing negative ion beams which are accelerated is used. In particular, it is well known that the method of using a plasma neutralizer is more efficient than the method of using a gas neutralizer. To use such a plasma neutralizer, it is necessary to optimize the conditions of the plasma source used for the neutralizer in order to increase the neutralization efficiency. In this study, plasma conditions for increasing the neutralization efficiency of negative ion beam (H^-) in H_2 plasma were investigated. The plasma neutralization efficiency was calculated using differential equations of beam fraction. To calculate the differential equations, density of neutral species and ions derived from a simple global model, and cross section derived from the relative speed between colliding particles, such as beam particle and electron, in plasma were used. By using these equations, the dependence of neutralization efficiency of negative ion beam in the H_2 plasma on electron density, electron temperature, and pressure were investigated.

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