

Isotope effect on impurity and bulk ion particle transport in the Large Helical Device

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Isotope effects of the ion particle transport both for carbon impurity and bulk ions are investigated in Large Helical Device (LHD) in a condition decoupled from electron particle transport. Better particle confinement for both impurity and bulk ions are observed in deuterium plasmas than in hydrogen plasmas. The following findings are presented in this paper. 1) Carbon impurity density gradient is negative (peaked profile with inward convection) inside the internal transport barrier (ITB) region in the deuterium (D) plasma, while it is positive (hollow profile with outward convection) in the hydrogen (H) plasma. 2) The decay time of D ion density measured with bulk charge exchange spectroscopy inside the plasma after the D pellet injections is longer than that of H ion density after the H pellet injections by a factor of 1.4. The difference in the decay time of H and D in the H-D mixture plasma strongly suggests that there should be a difference in deuterium and tritium (T) particle transport in the D-T mixture plasma in ITER.

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