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Study of light and heavy impurities transport in OH and ECRH plasmas on the T-10 tokamak

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The results of impurity (C, O, Ar, K, Fe, and W) transport investigation in OH and ECRH discharges on the T-10 tokamak are presented in this paper. The main attention is paid to a study of the impurity removal from the plasma center during ECRH.
It is shown that in the ohmic discharges neoclassical accumulation of impurities near the plasma axis occurs. This process enhances the effect of impurity removal during ECR heating.
The investigation of impurities transport in OH plasmas allows determining a dependence of impurity confinement times tau_z and anomalous diffusion coefficient D_zˆan on plasma parameters: tau_z˜gamma and D_zˆan˜gammaˆ-1, where gamma=n_e*Z_eff/I_plˆ1.5. Significant impurity accumulation followed by impurity density profile peaking relatively to the electron density is observed in ohmic discharges with high gamma.
The study of impurities behavior at the ohmic stage is performed to define the influence of initial conditions on ECRH impurity removal process. The effect of the light (C and O) impurities removal during ECRH has been demonstrated on the T-10 previously. In the present paper a removal efficiency from the plasma center K_eff(0) is introduced and it is shown that K_eff(0) increases with gamma and ECRH power per particle.
In contrast to the OH stage, wherein impurity peaking phase follows the long accumulation of impurities, at the ECRH stage the fast elimination of enhanced peaking (the first phase: 20 to 40 ms after ECRH start) is followed by the slow phase of exponential impurity decay (the second phase: 100 to 150 ms after ECRH start). The analysis of the light and heavy impurities behavior at the second phase shows that there are no significant differences of the transport coefficients for C, O, and Fe in the ECRH discharges on T-10.
Numerical simulation of impurity transport is performed in the transport code STRAHL including neoclassical and anomalous transport. Anomalous transport coefficients and their dependences on plasma parameters and auxiliary heating power are determined by modelling of dynamic and balance characteristics of intrinsic impurities during ECR heating.
At the last experimental campaign, new tungsten limiter has been installed instead of a carbon one. It allows carrying out experiments for an investigation of tungsten transport on the T-10 in OH and ECRH discharges.

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