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Metal Impurity transport control in JET H-mode plasmas with central Ion Cyclotron Radiofrequency Heating

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12 See Appendix of F Romanelli et al., Proc. 22nd IAEA Fusion Energy Conf. 2008,Geneva, Switzerland

An ICRH power scan has been performed in H mode low collisionality JET discharges in order to better characterize the behaviour of heavy impurities such as Ni and Mo in ITER relevant plasma situations and to explore means to control their profiles. The transport parameters of Ni and Mo have been measured by perturbing their densities via the Laser Blow Off technique. In the plasma core Ni and Mo experience an outward drift approximately proportional to the amount of injected RF power. Above about 3 MW of ICRH power the radial flow of Ni and Mo changes from inward to outward and the impurity profiles extrapolated to stationary conditions become hollow. At mid radius the impurity profiles become flat or slightly hollow. The application of central power changes the target plasma in many respects – in particular the profiles of q, ion temperature, electron temperature and rotation are modified - so that it is difficult to single out which of the above mentioned parameters plays the dominant role in the modification of the impurity behaviour. On the other hand, in the plasma core the variation of the pinch parameter v/D of Ni is particularly well correlated with the change of the normalized ion temperature gradient, in qualitative agreement with the neoclassical theory. The neoclassical origin of the flow inversion of Ni is also suggested by the gyrokinetic simulations of these discharges, whereby in all of the experimented circumstances the dominant electrostatic modes are ITG's driving Ni inward. Quantitatively, however, a discrepancy still persists, in that the experimental radial velocity is larger than the neoclassical one by up to an order of magnitude.

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