**Accelerated impurity exhaust by means of ICRF heating at LHD**

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Impurity accumulation in the plasma core and, consequently, radiation losses in stellarator plasmas can pose a challenge for the future fusion power plants. In this talk, we show that it is possible to provide increased transport selectively for impurities by applying a co-called “three-ion heating scheme” [1] to specially injected fluorine ions [2]. In stellarators, the magnetic field is corrugated and has a magnetic field ripple. This ripple allows for a significant fraction of toroidally trapped particles, which tend to escape from the plasma due to uncompensated drifts. This is an underlying reason for the difference in transport between tokamaks and stellarators. We show that even for impurity, species with high collisionality and low density, it is possible to increase the radial transport by consistently increasing the perpendicular energy of the ions. In our experiments, we demonstrate that the impurity confinement time is strongly dependent on the plasma composition, as expected for the three-ion ICRF scheme and also that the observed difference in the pump-out times cannot be explained by other transport mechanisms. In addition, we show preliminary simulation results that confirm our hypothesis of the observed fast impurity pump-out under specially applied ICRF.

1. Kazakov, Y. O., Ongena, J., et al. (2017). Efficient generation of energetic ions in multi-ion plasmas by radio-frequency heating. Nature Physics, 13(10), 973–978. https://doi.org/10.1038/nphys4167

2. Moseev, D, Kasahara, H., et al. (2022), Decoupling impurity from main ion transport in stellarators, submitted to Physical Review Letters