

Comparison of behaviors of recycling and impurities during Li aerosol and B powder injection to EAST plasmas

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Both Li aerosol and B powder droppers have been developed for wall conditioning and to mitigate edge local modes (ELMs). During experiments, Li or B is continually dropped from top ITER-like W/Cu divertor to plasmas with a speed of about 10m/s, driven by gravity. Both of Li and B injection is beneficial for recycling reduction and impurities accumulation, leading to ELMs fully suppression due to various mechanism^[1-3]. However, difference is clearly found. It is essentially to compare the effect on recycling and impurities between Li and B injection, to realize their allocation in future fusion devices.

Due to Li as a strong capture for hydrogen, the deuterium retention with a ratio of 40% after Li injection is much higher than that using B injection. The deuterium retention is no more different between plasmas with and without B injection. Consequence, the recycling that during Li injection is well reduced, much better than that its small decrease during B injection. In the view of impurities suppression, Li injection would reduce the impurities both at edge and center, possibly due to partially wall coating, whereas B injection would reduce center impurities to prevent accumulation.

In a conclusion, both methods using Li and B injection are effective to reduce recycling and impurities, and to suppress ELMs. B injection seems better than Li injection to reduce tritium retention for future fusion reactor using expensive tritium with activation.

[1] J.S. Hu, et al., Phys. Rev. Lett. 114 (2015) 055001

[2] R. Manigi, et al., Nucl. Fusion 58 (2018) 024003

[3] Z. Sun, et al., Nucl. Fusion 61(2021) 014002