Modification of wall retention by boron powder wall conditioning in ASDEX Upgrade

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Conditioning of the plasma facing components (PFCs) is essential for plasma performance in present day fusion devices. Especially for high-Z PFCs, coating with low-Z material is needed to perform some scenarios which require low scrape off layer (SOL) collisionality. At AUG the standard conditioning is done using a glow discharge with active gases such as diborane [1], which is routinely applied once a month. As an alternative conditioning technique, a boron dropper [2] was installed which gravitationally injects micron sized powders into the upper SOL. The advantages of this method are its use during normal plasma operation, which will be important for long pulse operation (in-situ coating), the absence of He, which is stored at the W PFCs and the flexibility of operation [3]. Additionally, using the actual plasma shape influences the distribution of the coating. For example, almost no layers are formed in the divertor by glow discharge conditioning, whereas strong deposition is found for dropper operation.

In this contribution we will discuss the influence of the boron on the neutral gas balance. The series of identical discharges was used for analysis. At the midplane, the neutral gas pressure is typically reduced by 30 % after injection of a sufficient amount of boron. More important is the influence of these injections on the amount of gas used during plasma start-up which has a strong impact on the current profiles in advanced scenarios. These results are discussed in comparison with a conventional boronisation.

[1] V.Rohde, et al., J. Nucl. Mater. 363-365 (2007) 1369
[2] A. Bortolon, et al., Nucl. Mater. Energy 19 (2019) 384-389
[3] R Lunsford et al., NF 59 (2019) 126034