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EX/P5-30: Nitrogen Seeding for Heat Load Control in JET ELMy H-mode Plasmas and its Compatibility with ILW Materials

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The challenge of achieving a scenario with sufficient energy confinement (H98(y,2)˜1), at high density (fGDL˜0.85) and compatible with the material selection of the DT phase of ITER is being addressed at JET with bulk beryllium (Be) main-chamber limiters and a full tungsten (W) divertor. This contribution investigates three aspects: reduction of inter-ELM power load to the divertor without significant degradation of the energy confinement via impurity seeding (Ne or N2); limitation of impurity production from the new plasma-facing materials ; compatibility of the extrinsic impurities with the ILW materials. Being chemically reactive, N2 can modify the chemical state of material surfaces which could change the fuel retention properties. An increase in gas retention has been measured in JET ILW seeded discharges. It is likely that this increase is not actually due to wall retention but linked to the formation of ammonia (ND3). An estimate of the rate of ND3 production will be given. Experiments at JET with the Carbon-Fibre Composite (CFC) wall explored the reduction of the inter-ELM power load in an ELMy H-mode scenario at high density (H98(y,2)˜1, fGDL˜0.8) with a mix of D2 with either Ne or N2, constant input power and close the type I to III ELMs boundary. The same discharges were repeated in JET ILW, so far with D2 fuelling only, with the aim to characterize the difference between the two wall materials. A striking difference in the ELM type domain has been observed: type I ELMs now exists in the type III ELMs domain of the CFC wall. The possible absence of a transition in ELM regime close to the H98(y,2)˜1 could be an advantage in achieving a stationary highly radiative scenario. A first exploration of N2 seeding shows a clear reduction in the nitrogen legacy in ILW in comparison with the CFC wall.

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