

Carbon Chemical Erosion Yield Experiments in the ITER Flux Regime and Beyond.

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Plasma Surface Interaction (PSI) in future fusion reactors such as ITER will occur under such extreme conditions that wall erosion and fuel retention may limit their prolonged operation. The development of surfaces that can handle particle fluxes of $10^{24} \text{ m}^{-2} \text{ s}^{-1}$ is a big priority for ITER. The current design of ITER uses carbon fiber composite (CFC) and tungsten as a divertor material [1]. However, the problem with using carbon as a wall material is that the hydrogen isotopes in the plasma cause chemical erosion. The chemical erosion yield is strongly dependent on the particle flux [2], where a higher particle flux results in higher net erosion, and the surface temperature [3].

Pilot-PSI [4] is a linear plasma generator specialized in producing ITER divertor relevant plasma conditions. Fine grain graphite (R 6650, SGL Carbon Group) was studied in-situ with optical emission spectroscopy on the CH band (around 431.4 nm) and the hydrogen Balmer-gamma line (434.0 nm) to monitor the chemical erosion for particle fluxes in the range of $10^{23} - 10^{25} \text{ m}^{-2} \text{ s}^{-1}$ and for bulk temperatures (from which the surface temperatures can be calculated) ranging from 100 °C up to 1200 °C.

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[2] J. Roth *et al.*, J. Nucl. Mater. 337–339, 970 (2005)

[3] V. Philipps *et al.*, Plasma Phys. Control. Fusion 42, Supp., B293 (2000)

[4] G.J. van Rooij *et al.*, Appl. Phys. Lett. 90, 121501 (2007)