

Impact of lithium-coated walls on plasma performance in the TJ-II stellarator

F.L. Tabarés, D. Tafalla, J.A. Ferreira, I. García-Cortés and the TJ-II Team.

Laboratorio Nacional de Fusión. CIEMAT. Avenida Complutense 22, 28040 Madrid, Spain

e-mail: tabares@ciemat.es

The TJ-II stellarator has been operated under several first wall conditions until now: full metallic scenario, with He glow discharge conditioning, full boronized walls, by o-carborane fed He glow discharges and, in the last campaign, lithium coating by several techniques. Particularly conspicuous has been the change in recycling associated to the different wall conditions, but also impurity content, with direct impact on radiative losses and total energy confinement is modified by the type of coating, as expected in a first-wall dominated plasma-wall interaction device. Lithium coating, tested for the first time in a stellarator, has proven a very effective method for particle control in TJ-II. Changes in the shot by shot fuelling characteristics as well as in the total particle inventory compatible with good density control have been recorded after the Li deposition. Thus, a factor of 4 increase in the fuelling rate at constant density compared with the B-coated walls was recorded, and even a higher value was estimated for the allowed H inventory in the puffing-controlled ECRH discharges. These changes were also mirrored in the radiation and edge radial profiles, with increased electron temperatures. This led to enhanced interaction with the poloidal graphite limiters, which had a deleterious effect on plasma performance. The lower instantaneous recycling also worked for the density control under NBI heating scenarios. Record values of plasma energy content were measured at densities up to $4.5 \cdot 10^{13} \text{ cm}^{-3}$ under Li-coated wall conditions.

In this paper, a comparison between B and Li walls in terms of plasma performance for TJ-II plasmas under ECR or NBI heating will be presented. Also, ideas about improving film homogeneity and durability will be addressed.