^{13}C Transport Studies in L-Mode Divertor Plasmas on DIII-D *

S.L. Allen[a], A.G. McLean[b], W.R. Wampler[c], D.G. Whyte[d], W.P. West[e], P.C. Stangeby[b], D.L. Rudukov[f], V. Phillips[g], G.F. Matthews[h], A. Nagy[i], R. Ellis[a], A.S. Bozek[e]

[a]*Lawrence Livermore National Laborabory, Livermore, California 94550, USA*
[b]*University of Toronto Insitute for Aerospace Studies, Toronto, MH3 5T6, Canada*
[c]*Sandia National Laboratories, Albuquerque, New Mexico 87185-1129, USA*
[d]*University of Wisconsin, Madison, Wisconsin 53706, USA*
[e]*General Atomics, San Diego, California 92186-5608, USA*
[f]*University of California, San Diego, La Jolla, California, 92093-0417 USA*
[g]*FZJ Julich GmbH/Euratom Institut für Plasmaphysik, TEC, D-52425 Julich, Germany*
[h]*Euratom/UKAEA Fusion Association, Culham Science Center, OX14 3DB Abingdon, UK*
[i]*Princeton Plasma Physics Laboratory, Princeton NJ, USA*

The ultimate choice of the first wall material for ITER and follow-on machines depends critically on the ability to control the tritium retention by the wall. With carbon walls in divertor tokamaks, the current model is that the tritium is co-deposited with carbon that has been primarily eroded from the main wall. Recent experiments to measure the location of the codeposited layers with ^{13}C injection have been carried out in JET plasmas [1], and these guided the setup for a similar experiment on the all-carbon DIII-D tokamak.

On the DIII-D experiment, we injected $^{13}CH_4$ into twenty-two identical L-mode discharges. The injection was from a distributed gas system located in the upper divertor plenum and enabled a high degree of toroidal symmetry. The plasma shape was a low triangularity ($\delta \sim 0.3$), lower single-null divertor, with short duration neutral beam injection for diagnostic measurement of T_i and the core carbon content. The injection level was adjusted so that there was a ~50% increase in the core carbon content, with a duration of ~3 s on each shot. The injection did not cause any noticeable change in the T_e or n_e time history of the discharges. The plasma shape remained very constant; the divertor strike points were controlled to within a few mm at the divertor plate. The gaps around the plasma in the main chamber were also carefully controlled. This experiment was carried out on the last day of the experimental campaign, and no baking or cleaning were performed afterwards.

At the beginning of the subsequent machine vent, 29 carbon tiles were removed for analysis. These were located both in the divertor and vessel walls, and at several toroidal locations. The detailed surface analysis techniques used to measure the ^{13}C in each tile are presented in [2]. Spectroscopic measurements of carbon and comparisons with modeling are presented in [3], and OEDGE modeling in [4]. We present here an overview of the measured poloidal and toroidal ^{13}C distribution and detailed measurements of the L-mode divertor plasma.

[1] J. Likonen et al., FED 66-68 (2003) 219-224.
[2] W.R. Wampler, et al., these proceedings.
[3] A.G. McLean, et al., these proceedings.
[4J J.D. Elder, et al., these proceedings.

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