DEUTERIUM RETENTION BY IMPLANTATION IN CARBIDE-DOPED GRAPHITES

M. Balden[a*], K. Durocher[a], J. Roth[a], C. García-Rosales[b], and J. Echeberria[b]
[a]Max-Planck-Institut für Plasmaphysik, EURATOM Association, D-85748 Garching, Germany
[b]Centro de Estudios e Investigacions Técnicas de Guipúzcoa and Escuela Superior de Ingenieros, Universidad de Navarra, POB. Box 1555, 20009 San Sebastián, Spain

The hydrogen retention of plasma-facing materials is of high concern for future fusion devices. For carbon-based material the retention by implantation has to be considered in addition to the main problem of deposited hydro-carbon layers with a high hydrogen content. The amount of erosion and, therefore, of co-deposited layers can be reduced by the use of doped carbon-based materials.

Carbide-doped graphites were manufactured in the frame of a project which deals with the optimisation of doped fine-grain graphites in view of improved thermal conductivity and mechanical properties, and of reduced erosion by hydrogen bombardment (especially chemical erosion). Due to the identical manufacturing processes for these doped graphites (with dopants such as B_4C, SiC, TiC, V_8C_7, WC, ZrC) the structure is nearly identical for all of them eliminating the influence of the structure on the retention . Therefore, the influence of the dopant is observable.

The retention of 1 keV deuterium implanted at room temperature in these doped graphites has been investigated up to a fluence of 10^{24} D/m^2 by ion beam analysis and thermal desorption spectroscopy (TDS). The influence of different heating rates (2, 6, 13 K/s) is discussed. The results are compared to those of pyrolytic graphite, pure carbides and doped graphites of other manufacturers (with B, Si, Ti as dopants).