SOFE05-004

GAS TRAPPING AND SURFACE ANALYSIS STUDY OF BORON FILM DEPOSITED USING ORTHO-CARBORANE

H. A. Pathak, P. M. Raole, C. Jariwala, P. Semwal and Y. C. Saxena
Institute for Plasma Research, Bhat, Gandhinagar: 382428, INDIA
haresh@ipr.res.in

Plasma material interaction plays a crucial role in tokamak experiments. Trapping and recycling of fuel atoms due to plasma material interaction on first wall has significant impact on effective fuel control. Boronization is used on tokamak devices to reduce impurities and to achieve effective fuel control. Objective of present work is to study the characteristics of boron film, deposited using Ortho-Carborane ($O\text{-}C_2B_{10}H_{12}$) in hydrogen glow discharge plasma, in terms of its composition and trapping of hydrogen and other gases. Hydrogen glow discharge is sustained in plasma chamber with plasma parameters, (a) n_e = 1- 5 x 10^6 cm^{-3} and (b) T_e = 3 - 10 eV. O-Carborane is sublimated at 70° C in sublimation chamber and its vapor is introduced in hydrogen glow discharge for in situ deposition of boron film. XPS study of the de-convoluted B 1s peak of boron deposited on molybdenum substrates reveal that B-O and B-C bonding is present in the film. To study the properties of boron film in terms of hydrogen trapping, plasma chamber is filled with hydrogen and maintained at 1 x 10^{-2} mbar for 10 hours after, (i) conditioning the wall only by baking at 150° C and (ii) boronization of plasma chamber with 0.2 grams O-Carborane. After that the plasma chamber is pumped with baking on and QMA data is acquired. We found that after 22500 sec, 2.52 x 10^{-4} mbarliter of hydrogen and 9.75 x 10^{-3} mbarliter of water vapor is released for case (i), while, 5.54 x 10^{-4} mbarliter of hydrogen and 3.83 x 10^{-3} mbarliter of water vapor is released for case (ii). We also studied hydrogen release from wall after switching off hydrogen glow discharge. We observed that, (A) after 1000 sec for case (i) 0.34 mbarliter of hydrogen is released while for case (ii) about 0.28 mbarliter of hydrogen is released and (B) for case (i) hydrogen pressure comes back to the value maintained during glow discharge in about 800 sec, while for case (ii), it is more than 1600 sec. These results indicate high surface trapping of hydrogen and high chemical gettering of water vapor by boron film. More results on XPS analysis and gas trapping will be presented in the paper. Paper will also discuss hydrogen diffusion time constants for case (i) and (ii).