CHARACTERIZATION OF a-C/B:H THIN FILMS AND PLASMAS BY CARBORANE ($C_2B_{10}H_{12}$) FOR KSTAR BORONIZATION*

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Korea Superconducting Tokamak Advanced Research (KSTAR) device has been boronized by carborane ($C_2B_{10}H_{12}$) to remove oxygen and to reduce impurity release from the wall, since carborane is solid, non-toxic, non-explosive and is easily evaporated, while diborane (B_2D_6) is toxic and explosive. To find the best condition for the removal of oxygen before application to KSTAR, one gram of carborane is tested in a cylindrical test chamber to check the expected deposition in KSTAR. Laboratory experiments are performed to improve a-C/B:H oxygen getter property and to calibrate emission spectroscopy and RGA. A carborane injection system is used to produce carborane vapor by heating of carborane solid powders up to 150 degree of Celsius. Helium glow and filament discharges are generated with the same KSTAR target pressure (~$5x10^{-3}$ Torr) from low base pressure (~10^{-7} Torr) to find the optimum discharge condition. Deposition layer of a-C/B:H is characterized by ellipsometry, AES and XPS after boronization of carborane ($C_2B_{10}H_{12}$) to the silicon wager in terms of magnetic field and sample position with respect to the source. From the preliminary test, we found that thickness of a-C/B:H had variation of 10 ~ 130 nm depending upon magnetic field and position within the chamber. Plasma is generated by a pulse mode with frequency of ~0.13 Hz with 3second plasma generation, and they are characterized by an electric probe, RGA and/or optical emission spectroscopy systems before, during, and after the processes in low temperature and low density plasmas (~10^9 cm^{-3}). Boronized material sample for KSTAR is exposed to the high density plasma (~10^{12} cm^{-3}) generated by LaB^6 cathode source, and is characterized.

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