# §13. Behavior of Wall Material Impurities Released to Magnetized Plasma and its Effects on Plasma Properties

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GAMMA-10 end plasmas have several advantages in making plasma materials interaction experiments comparing linear plasma devices such as high ion energy with Maxwell distribution and presence of a high magnetic field. Under the strong magnetic field, emitted impurities from plasma facing materials are subject to gyromotion and plasma pressure after ionization. It is well known that impurities with shorter ionization length than gyroradius return to near original release location, which effectively reduces sputtering erosion. Therefore, erosion and material migration can be studied under conditions which is not realized in conventional linear plasma devices. These results are valuable for material migration modeling and validation of atomic data in plasmas.

In this study, chemical sputtering of graphite and local transport phenomena of carbon atoms together with high Z atoms are investigated. Graphite and Mo samples were installed at the E-divertor test section with a sample surface tilted 45 deg from magnetic lines of force. Erosion flux of carbon and Mo will be measured by a framing camera with an appropriate spectral line filter. We also employed spectrometer to observe lights emitted from eroded atoms from the samples. Roof limiter used in this study is shown in Fig. 1, which was installed at the top of V shaped divertor test modules and exposed to plasma only this study.

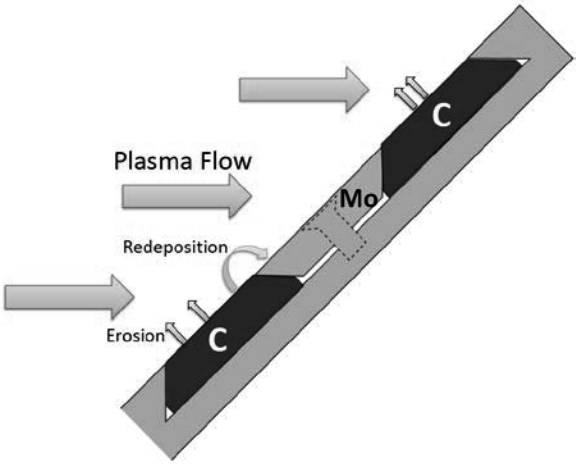


Fig. 1 Sample holder for this study. No heating device is attached.

Plasma exposed surfaces of the graphite and Mo targets are shown in Fig.2. Most of the surfaces look intact, suggesting surface erosion and related surface modification are not significant except for the lower edge of the graphite plate on the upper side. Here, deposition of metallic materials (shown in red rectangle, not yet analyzed) is observed. Since this deposition is seen only on the upper graphite sample, it is likely eroded Mo. If eroded Mo directly deposited without ionization, similar deposition should be observed on the lower graphite sample. Possible mechanisms are ionization followed by gyromotion or by motion of ions driven by plasma flow towards the target. To understand detailed mechanisms, surface analysis such as EDX is necessary to obtain distribution of metallic materials on graphite. We also plan to collaborate with simulation research group to understand behavior of eroded particle from the targets.

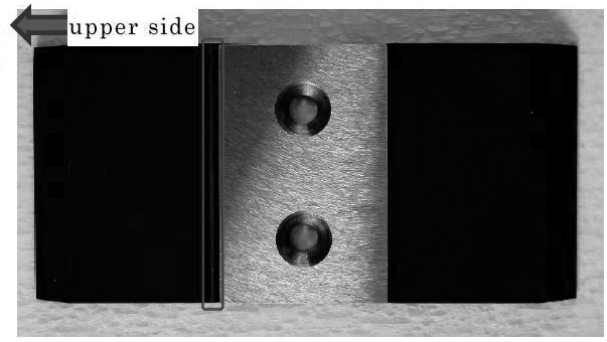


Fig. 2 Surface of exposed samples to GAMMA-10. Left side of the figure corresponds to upper side of GAMMA-10.

Finally, same as last year, we also hold the meeting to exchange information and discuss details and future works. Topics are (1) Highlights of 19th ITPA (SOL/DIV) topical group meeting, (2) Progress of experimental research in domestic plasma devices and heat flux devices in universities, (3) Divertor technology, including ITER and JT-60SA divertor components development, (4) Progress of experimental research in domestic magnetic confinement devices. This meeting is a joint meeting of Tsukuba University symposium, sub-cluster meeting of plasma physics (SOL and divertor) and fusion technology (blanket sub-cluster and divertor sub-cluster).This opportunity is very valuable for fusion plasma and engineering community and we continue to hold this meeting in the next year.