Doppler Broadening Study of Low Energy Hydrogen Ion Reflection at Metal Surfaces

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Velocity distributions of hydrogen isotope atoms reflected at the surfaces of plasma facing component are important to predict the fundamental processes in edge plasmas of future fusion devices. For example, tantalum as compared to tungsten should exhibit a different hydrogen reflection coefficient at lower energy due to the surface reaction parameters despite the similar nucleus mass. Doppler broadening of hydrogen line emissions from atoms reflected at tungsten and tantalum metal surfaces is compared in the initial ion energy below 1 keV. Figure 1 shows the structure of the target holder with the axis aligned to the axis of the magnetic field. The metal sheets including tungsten and tantalum are positioned at a 45-degree angle with respect to the magnetized hydrogen plasma column to make the Doppler broadening measurement possible in the region outside of the ionizing plasma as shown in Fig. 2. No substantial difference in reflected particle component was observed, while the hint was observed that the material can affect the local concentration of excited molecules near the sample metals. Figure 3 shows Hα emission lines on tungsten surface for varying bias voltage.

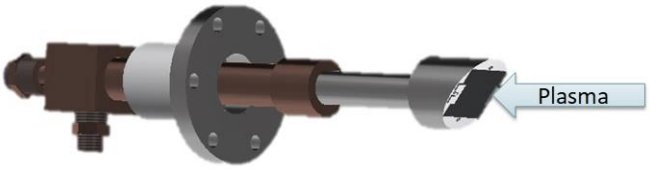

Figure 1: Substrate holder system which contains the metal materials.

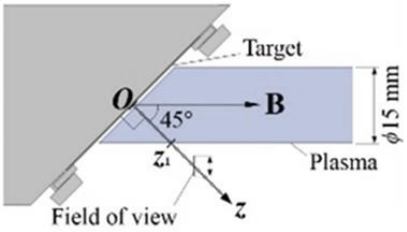

Figure 2: Field of View for Doppler Broadening Study

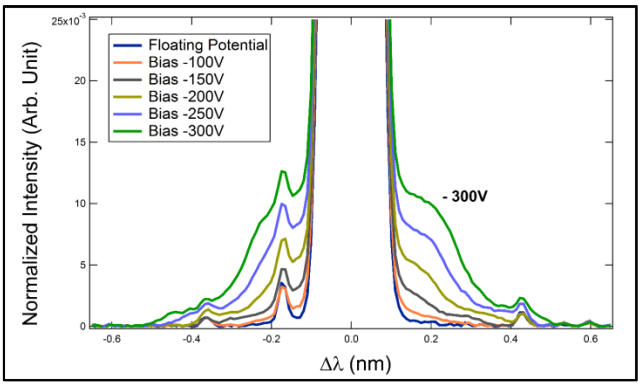

Figure 3: Hα Emission Lines on Tungsten Surface