



Investigation of Impact of Negative Ions on the Hydrogen Plasma Characteristics on Metal Targets

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The presence of the negative ions is investigated through its impact upon the plasma characteristics of the hydrogen plasma on to metal targets, tungsten and palladium. The metal sheet targets are positioned at a 45-degree angle with respect to the magnetic field and a clamp is used to hold them to the substrate holder. The characteristics of the hydrogen plasma, mainly, electron density (n_e), electron temperature (T_e) and plasma potential (V_p) are measured with a Langmuir probe. The probe is positioned 50 mm from the metal target, as shown in Fig. 1. The probe is made of tungsten with $\phi 0.6$ mm in diameter and 2.4 mm length and fully immersed in a magnetized hydrogen plasma. A thin wall copper tube protects the tungsten wire from noise and is shielded by a ceramic alumina tubing from plasma radiation. Pressure condition inside the chamber is at 1.2 mPa and with discharged current of 1 A is maintained during process.

Initial results of the I_{sat} region for hydrogen plasma on tungsten surface at -250 V to -300 V target bias are almost the same value while the n_e increases, Fig 2(a). Computed T_e for tungsten is less than 2 eV and n_e ranges from 1.7×10^{11} – 3.2×10^{11} cm⁻³ depending on the applied bias voltage. The I_{sat} region for the hydrogen plasma on palladium is comparable at -100 V to -300 V bias voltages, Fig 2(b). There is also observed gap on the electron densities between floating potential and the applied bias conditions. The electron temperature (T_e) for palladium is lower and n_e ranges lower than that for hydrogen depending on the applied bias voltage. The effect of negative ions in the plasma characteristics of hydrogen plasma is discussed.

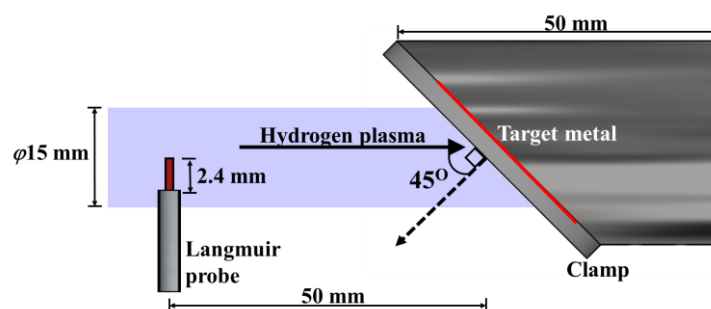


Figure 1. Hydrogen plasma metal targets; tungsten and palladium. The Langmuir probe position is indicated

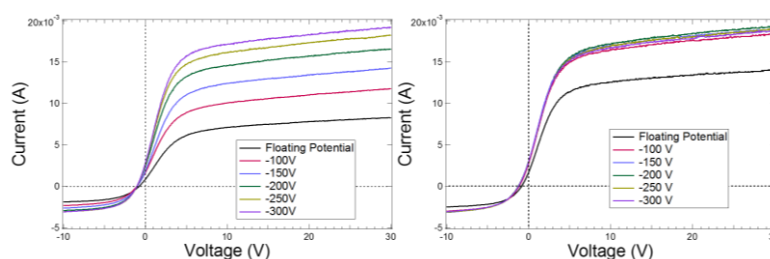


Figure 2. I-V Characteristics of plasma near (a) tungsten and (b) palladium target