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P4.028 Development of cesium-free negative hydrogen/deuterium ion source by sheet plasma

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Negative ions play an essential role for Neutral Beam Injection (NBI) system of steady state magnetic nuclear fusion. We have development of negative ion sounrce in a cesium-free discharge by the magnetized sheet plasma device, TPD-Sheet IV [1]. Negative ions are formed by volume-production, that is, the dissociative attachment of low energy electrons (Te = 1-2 eV) to highly vibrationally excited molecules. These molecules are attributed to the electron-impact excitation of molecules by high energy electrons (Te > 10 eV) in the plasma column. Negative hydrogen/deuterium ion beams are extracted through the small hole (6mm in diameter) with an extraction voltage VEX of 3 kV at a neutral gas pressure Ps of 0.3 Pa. The maximum negative hydrogen ion beam current density JH- is about 7.0 mA/cm2 at discharge current Id of 50 A. On the other hand, the negative deuterium ion beam current density JH- is obtained about 4.0 mA/cm2 at Id of 80 A.
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