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Development of a Cascade Arc Discharge for an Atmosphere-vacuum Interface. SHINICHI NAMBA, YUUKI IWAMOTO, MEGUMI UEDA, TAKUMA ENDO, Hiroshima Univ., NAOKI TAMURA, National Institute for Fusion Science — In order to demonstrate a high-performance plasma window as a vacuum interface, a compact and low-cost wall-stabilized arc (cascade arc) discharge apparatus has been developed. The device diameter was 120 mm, a length of 100 mm and its weight of <15 kg, which had a 3.2mm-CeW cathode, eight intermediate electrodes, and a CuW anode to generate the plasma channel with an opening of 3 mm. Absolute pressures in the discharge and expansion sections were measured to examine the performance as the plasma window. Visible emission spectroscopy to determine the plasma parameters has been carried out as well. At Ar discharge of 50 A, the gas pressure significantly decreased from 100 kPa to 0.1 kPa between the discharge channel. Spectral analysis indicated that the plasma had an electron temperature of >1 eV and a density of 2.410^{16} cm^{-3} at 50 A at the anode exit. By installing a higher-power water pump and cooling tower, providing a pressure of 10 atm at a flow rate of 15 L/min, we will increase the discharge current up to 100 A to obtain much hot, dense arc plasmas.

Shinichi Namba
Hiroshima Univ.

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