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Effect of negative ion density on plasma flow measurement of a Mach probe in DC Ar/O_2 plasma I.J. KANG, M.-K. BAE, I.S. PARK, S.H. LEE, S.J. JEONG, K.-S. CHUNG, Dep. Electrical Engineering, Hanyang University, Seoul, Republic of Korea — In DC Ar/O_2 plasma, axial plasma flow velocity was measured by using a parallel Mach probe. To analyse the effect of negative ion density on the deduction of the Mach numbers, the ratio of upstream to downstream current densities was measured by adjusting the ratio of flow rate of O_2 = 0 – 10 % to that of Ar. Electronegative plasma was performed by adding O_2 gas to Ar plasma with a DC filament discharge source. The normal conditions, measured by a cylindrical electric probe, of a DC filament discharge source with heating power (4.3 V/33 A) and discharge power (32 V/0.5 A) are the following: plasma density = 1 – 3 10^9 cm^{-3} and electron temperature = 1 – 4 eV. To check the effect of negative ion density in term of O_2/Ar, negative ion density was estimated by measurement of a cylindrical electric probe. Before analysis of effect of negative ion density, the results of a Mach probe in pure Ar plasma were fit to the data of a laser induced fluorescence system, which composes of a tunable diode laser with a master oscillator power amplifier (MOPA) and fluorescence light collection system, to check plasma flow velocity measured by a Mach probe with an unmagnetized Mach probe theory. For the effect of negative ion density on the deduction of the Mach numbers, variations of Mach numbers were analysed with comparison of pure to negative ion containing plasmas in same pressure.

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