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Experimental investigation of argon metastable density and electron temperature in low-pressure plasma by line-ratio OES technique[1]
YOUNG-KWANG LEE, YU-SIN KIM, JAE-WON LEE, HYE-JU HWANG, CHIN-WOOK CHUNG, Hanyang University, Korea — The measurement of metastable atom densities and electron temperatures are performed in inductively coupled plasma (ICP) source (13.56 MHz) combined with biased electrode (12.5 MHz), in pure argon or in mixtures of N2. The argon metastable densities and electron temperatures are derived under the different discharge conditions, i.e., E-H mode transition, rf power biasing and Ar-N2 mixtures. The observation of certain argon spectral lines (750.4, 751.5 and 811.5 nm) is made with optical emission spectroscopy (OES) at the pressure of 50 and 100 mTorr. In the same plasma conditions, rf-compensated Langmuir probe is used to measure the electron energy distribution functions (EEDFs) that provides the accurate rate coefficients to calculate the line-ratio OES method. It is found that the 1s5 metastable density was found to be the highest concentration at mode transition region but it decreases with increasing rf bias power or mixing ratio of N2. The measurements of electron temperature measured by line-ratio OES and probe confirmed that electron temperature was relatively uniform at mode transition but it increases with increasing rf bias power or mixing ratio of N2.

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