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**Numerical Study of Hysteresis Phenomenon in an Inductively Coupled Plasma in Ar** TOSHIKAZU SATO, TOSHIAKI MAKABE, Keio University — As is well known, there exist two sustaining mechanisms in inductively coupled plasmas (ICPs), capacitive coupling mode (E mode) and inductive coupling mode (H mode)[1][2]. Especially in H mode, ICP in Ar is sustained by direct ionization and stepwise ionization of metastables. The ratio of these two processes significantly depends on the external conditions. A large amount of metastables in an ICP reactor gives a strong hysteresis of the plasma density as a function of input power, because high density plasma can be sustained by way of the stepwise ionization even at low power supply. In this paper, we numerically investigate the role of Ar metastables in the sustaining mechanism and the hysteresis characteristics in an Ar-ICP. The contribution of the stepwise ionization of Ar metastable to the total plasma production considerably depends on the gas pressure. The plasma density shows a strong hysteresis under the presence of metastables at 50 mTorr. We will also discuss the dependence of the hysteresis characteristics on gas pressure.

[1] Y. Miyoshi et al, IEEE Trans. Plasma Sci., 30, 130 (2002)

[2] Y. Miyoshi et al, J. Phys. D: Appl. Phys., 35, 454 (2002)

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