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Simulation of Plasma Characteristics for Inductively Coupled Argon Plasma Using Dual-Frequency Antennas[1] XUE-CHUN LI, XIAO-YAN SUN, YOU-NIAN WANG, Dalian University of Technology — A large-area wafer size is necessary for plasma processing in the micro-electronics industry. However, it is one of the most important issues to obtain uniform plasma over a large-area substrate in addition to high-density plasmas for the plasma processing. Recently, the experimental study on the dual-frequency inductively coupled plasma (ICP) has been reported as a mean of improving the plasma uniformity over the large-area substrate [1]. In this work, we develop a self-consistent method combined with the electromagnetic theory and fluid model to simulate the plasma characteristics for dual-frequency inductively coupled argon plasma. In the model, the ICP source consists of two planar-spiral coils. We investigate the plasma uniformity problem by adjusting the parameters of the two coils, such as the RF current, the position of the coils and the RF frequency ratio. It was found that the uniformity of the ion density over the wafer is improved with dual-frequency antennas comparing with a single-frequency antenna. The plasma uniformity increases when the coils are located farther from the centre of the ICP source. It is consistent with the experimental study.

[1] A. Mishra, K. N. Kim, T. H. Kim, and G. Y. Yeom. Plasma Sources Sci.Technol. 21 (2012) 035018.

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