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Experimental investigation of standing wave effect in dual-frequency capacitively coupled argon discharges: role of low frequency source.[1] YONG-XIN LIU, KAI ZHAO, YOU-NIAN WANG, School of Physics and Optoelectronic Technology, Dalian University of Technology, China — It is well known that the plasma non-uniformity caused by the standing wave effect has brought about great challenges for industrial applications. To improve the plasma uniformity, another low-frequency (LF) source was introduced, aiming to examine its effect on the radial distribution of plasma density in capacitively coupled argon plasma driven by a very-high-frequency (VHF, 100 MHz) source. The radial profiles of plasma density and spatio-temporal distributions of the electron-impact excitation rate were determined by utilizing a hairpin probe and the phase resolved optical emission spectroscopy, respectively. In this work, two typical cases [i.e., the LF and VHF sources are applied on one electrode (case I) and different electrodes (case II)] have been taken into account. Our experimental results indicate that for case I an excellent plasma uniformity can be achieved by adjusting the LF voltage amplitude or LF frequency, while the LF component was found to have a small effect on the plasma uniformity for case II. To understand the different results between these two cases, the electron excitation dynamic and the frequency coupling mechanism on each case were analyzed based on the measured spatio-temporal distributions of the electronic excitation rate.

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Yong-Xin Liu
Dalian University of Technology

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