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The dynamics of the electron impact excitation in pulse-modulated Ar/O2 inductive coupled plasmas. FEI GAO, CHAN XUE, YU-RU ZHANG, YOU-NIAN WANG, Dalian University of Technology — It is well known that there exists E mode and H mode in ICP. In E mode, the temporal evolution of the electron impact excitation rate shows single peak structure, while it displays bimodal structure in H mode over one rf cycle. Therefore, the peak numbers of the electron impact excitation rate can be used for determination of the E-H mode transition. In this paper, an intensified charge-coupled device camera is applied to investigate this dynamics of the electron impact excitation in pulse-modulated rf Ar/O_2 ICP, and the end time of the E-H mode transition at the beginning of the pulse is investigated for the first time. It is founded that the end time of the E-H mode transition at the initial stage of a pulse period decreases with increasing the duty cycle or gas pressure, but increases with the source power increasing. This means that the effects of the E-mode at the beginning of a pulse can be weakened to some extent by adjusting the discharge parameters. In addition, we also examined the spatial-temporal distributions of the electron impact excitation rate all over the whole pulse period (with microsecond time-resolution) and especially in the steady state at H mode. The measurements reveal that the axial distribution of the electron impact excitation rate concentrates closer to the quartz window with increasing the O_2 content/pressure during H mode operation. Meanwhile, the bimodal structure becomes more prominent at higher O_2 content/pressure.

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