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Fluid/MC simulation of mode transition in argon inductive discharge with the adjustment of impedance network SHU-XIA ZHAO, FEI GAO, YOU-NIAN WANG, Dalian University of Technology — A complete external circuit has been added into the hybrid Fluid/MC model to investigate the effects of the matched condition of the whole impedance network on mode transition in argon inductively coupled plasma. This circuit composes of the invariable voltage radio-frequency (rf) source, the Γ-type matched impedance network, the coil and the inductive and capacitive plasma-transferred impedances. In the simulation, the coil current and voltage drop across the coil, as well as the phase between them, are self-consistently calculated from the circuit. When the series capacitance is monotonically increased, the discharge first transfers to H mode and then drops to E mode again, gradually. During the process, the plasma density at the axis center first increases and then decreases, and meanwhile the electron temperature here displays the opposite trend. In addition, the profiles of temperature during E mode are rather smooth, and they peak obviously near the coil in H mode. The mode transition is presumably triggered by the power variation arising from the change of the matched condition of the circuit. The real part of the complex coil current and the imaginary part of the coil voltage both approach to their maxima when the discharge circuit is located in pure-resistance case, and away from this point they reduce significantly. The dependence of the circuit property on the inclusion of plasma impedance is also discussed. The evolution of the whole circuit resistance is strikingly influenced after the plasma transferred impedance is included.

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