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Electrical description of N₂ capacitively coupled plasmas with the global model MING-LU CAO, YI-JIA LU, JIA CHENG, LIN-HONG JI, Tsinghua Univ, ENGINEERING DESIGN TEAM — N₂ discharges in a commercial capacitively coupled plasma reactor are modelled by a combination of an equivalent circuit and the global model, for a range of gas pressure at 1~4 Torr. The ohmic and inductive plasma bulk and the capacitive sheath are represented as LCR elements, with electrical characteristics determined by plasma parameters. The electron density and electron temperature are obtained from the global model in which a Maxwellian electron distribution is assumed. Voltages and currents are recorded by a VI probe installed after the match network. Using the measured voltage as an input, the current flowing through the discharge volume is calculated from the electrical model and shows excellent agreement with the measurements. The experimentally verified electrical model provides a simple and accurate description for the relationship between the external electrical parameters and the plasma properties, which can serve as a guideline for process window planning in industrial applications.

Ming-Lu Cao
Tsinghua Univ

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