Effect of Pulse Parameters on Discharge Characteristicsin Pulse-modulate Radio-frequency Atmospheric Pressure Discharges with Argon-oxygenMixture

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Atmospheric radio-frequency (RF) discharge draws increasing attention in recent years. However,the high powerconsumption and gas temperature restrict their application scope. As a developing innovative technology, pulse-modulated radio-frequency atmospheric pressure glow discharges (RF-APGDs) can achieve low temperature plasma with reduced power consumption and gas temperature, it effectively improve atmospheric radio-frequency discharges. Moreover, it was found that low-temperature plasmas can generate plenty of reactive oxygen species(ROS), and the ROS play a key role in the application processes, especially in their biomedical and environmental applications. Due to the lack of diagnosis methods of ROS,the ROS generation and consumption mechanism is still not clear. Numerical simulation method is advantageous to analyze ROS generation and consumption mechanism. In this work, a one-dimensional ?uid model is developed for describing the pulse-modulated radio-frequency glow discharges with argon-oxygen mixture. We take 53 main reactions and 15 species of argon-oxygen mixture discharge into consideration. The effect of pulse parameters (modulation frequency and duty cycle)on the characteristics of Ar-O_2 hybrid discharges is discussed.The computational results show that, by choosing appropriate modulation frequencies and duty cycles, the production of ROS can be effectively optimized. The results can be used as a theoretical reference for applications of ROS generated in atmospheric RFdischarges.

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