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# Mode Transition in Microsecond-Pulse Gliding Discharges at Atmospheric Pressure

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In an inhomogeneous electric fields, there is several kinds of discharge mode existing in microsecond-pulse gliding discharges, which could be widely used in different fields. In this paper, in order to investigate mode transition among different discharge modes, effect of gas flow, pulse repetition frequency (PRF), and electrode distance on microsecond-pulse gliding discharge was studied by the measurement of the voltage-current waveforms and discharge images. Experimental results showed that both the breakdown voltage of spark and ignition voltage of diffuse decreased with the increase of the PRF, which was closely related to the memory effect of the residual particles in the time interval. Moreover, all other things being equal, breakdown voltage of spark also decreased with the increase of the gas flow, while ignition voltage of diffuse remained uncharged, which could be explained by the state of the air flow. Increasing the gap distance led to the increase of the breakdown voltage for spark mode. Furthermore, the diffuse discharge might appear when the electrode gap exceeded or equaled 5 mm. Such variation was closely related to electric field strength. In addition, when the applied voltage was 18.5 kV, diffuse-to-spark transition occurred when the PRF increased and the gas flow decreased. When the applied voltage was 12.1 kV, diffuse mode could transit to corona or spark mode when the electrode distance changed in atmospheric pressure air.

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