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**Study on the mode-transition of nanosecond-pulsed dielectric barrier discharge between uniform and filamentary by controlling pressures and pulse repetition frequencies** SIZHE YU, XINPEI LU, Huazhong University of Science Technology — We investigate the temporally resolved evolution of the nanosecond pulsed dielectric barrier discharge (DBD) in a moderate 6mm gap under various pressures and pulse repetition frequencies (PRFs) by intensified charge-coupled device (ICCD) images, using synthetic air and its components oxygen and nitrogen. It is found that the pressures are very different when the DBD mode transits between uniform and filamentary in air, oxygen, and nitrogen. The PRFs can also obviously affect the mode-transition. The transition mechanism in the pulsed DBD is not Townsend-to-streamer, which is dominant in the traditional alternating-voltage DBDs. The pulsed DBD in a uniform mode develops in the form of plane ionization wave, due to overlap of primary avalanches, while the increase in pressure disturbs the overlap and DBD develops in streamer instead, corresponding to the filamentary mode. Increasing the initiatory electron density by pre-ionization methods may contribute to discharge uniformity at higher pressures. We also find that the dependence of uniformity upon PRF is non-monotonic.

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