Atmospheric pressure cold plasma jets represent a rapidly developing technology of non-thermal atmospheric-pressure plasma sources, and have attracted much attention of the researchers in recent years due to their outstanding features and their promising applications in different fields, such as materials processing, cleaning and disinfection of the equipment surface, biological organization structure and function resumption, microbe gene mutation breeding, etc.\(^1,2\)

In this study, an atmospheric pressure dielectric barrier discharge (APDBD) plasma is initiated between a powered honeycomb-like hollow electrode and a downstream concentric grounded ring electrode driven by a 25 kHz AC power supply. In particular, the plasma generator is characterized by two separated gas channels, which are the inner hollow electrode and the space between the inner electrode and the dielectric glass tube, respectively. And the speed of the gas flowing through these two channels can be controlled independently. The characteristics of the APDBDs are studied by means of the electrical and spectroscopic diagnoses. The experimental results demonstrate that the discharge volume of the single plasma stream is scaled up, and the high densities of the chemically reactive species are achieved. These features are mainly attributed to the application of the honeycomb-like hollow electrode. In addition, the separate flow control of the gases is also effective in increasing the length of the plasma stream and maintaining the stability of the discharges.


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