Features of forming atmospheric pressure plasma jet in helium and argon flows

O. Stepanova[1], M. Pinchuk[2], A. Astafiev[2], Z. Chen[3]

[1] *Saint Petersburg State University, St. Petersburg, Russia*

[2] *Institute for Electrophysics and Electric Power of Russian Academy of Sciences, St. Petersburg, Russia*

[3] *Anhui University of Technology, Maanshan, China*

Argon and helium gases are the main common substances to generate cold atmospheric pressure plasma jets (APPJ) for biomedicine applications. We studied the features of forming APPJ in helium and argon. An electrode system assembled as a high-voltage inner electrode inside a quartz tube and a grounded electrode – ring was used. The quartz tube served as a dielectric barrier to initiate dielectric-barrier discharge (DBD). The developing discharge inside the tube и propagation of APPJ along the helium and argon flows (guided streamers) into an ambient air was registered by an intensified charge coupled device (ICCD) camera Andor Tech. To supply the discharge a power with a tunable frequency and controlled duty cycle was applied.

The discharge in argon differs from the discharge in helium because of a high inhomogenuity with the formation of the bright filaments and broken straightly defined streamers (Fig. 1(a)). They pass out into the surrounding air from the tube and form a luminous image of the jet that we can see.

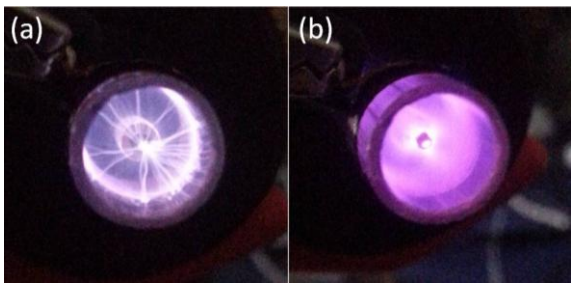

Fig. 1 Images of DBD structure in argon (a) and helium (b)

The discharge in helium has a diffuse nature (Fig. 1(b)). Nevertheless, with the increase in the gas flow rate, filaments structure with a greater brightness occurs. The rates of development of streamer structures for both types of discharge are of the same order of magnitude ~ 1 cm/μs.