A ROOM-TEMPERATURE AIR PLASMA NEEDLE DEVICE DRIVEN BY SUB-μS PULSES*

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The biomedical applications of atmospheric pressure non-thermal plasma have recently been attracting significant attention. Currently, the working gases of most of the plasma jet devices are noble gases or the mixtures of the noble gases with small amount of O^2, or air. If ambient air is used as the working gas, several serious difficulties are encountered in the plasma generation process. Amongst these are high gas temperatures and disrupting instabilities. Equally important, for biomedical applications, it has strict requirement for the safety of plasma devices. It is preferable that the device can be hand-held and the plasma can be directly touched by a human without any harm.

In this paper, rather than using noble gas, room air is used as working gas for an atmospheric pressure room-temperature plasma. The plasma is driven by sub-microsecond pulsed directed current voltages. Several current spikes appear periodically for each voltage pulse. The first current spike has a peak value of more than 1.5 A with a pulse width of about 10 ns. Emission spectra show that besides excited OH, O, N_2(C-B) and N_2^+(B-X) emission, excited NO, N_2(B-A), H and even N emission are also observed in the plasma, which indicates that the plasma may be more reactive than that generated by other plasma jet devices. Utilizing the room temperature plasma, preliminary inactivation experiments show that *Enterococcus faecalis* can be killed with a treatment time of only several seconds.

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