
Physicochemical characteristic study on the He/H₂O plasma jet

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The active species (OH, O and H₂O₂ etc.) in plasma play important role in bacterial killing and wound healing. Low gas temperature of plasma is another requirement while treating heat labile tissue. A DBD structured He/H₂O plasma jet can effectively produce OH and H₂O₂ with low gas temperature. In this paper, a needle-ring shaped DBD jet is investigated. The voltage and current waveforms are recorded to exhibit a transition from pulsed mode to arc mode. Spatiotemporal resolved optical emission lines in plasma jet are measured. Spatially resolved gas temperature, vibrational temperature, electron density and electron excitation temperature are deduced from these lines. Meanwhile, H₂O₂ production in saline solution indicates that the highest energy efficiency of H₂O₂ production is achieved with He/H₂O plasma jet in bullet mode when water vapor concentration is 1200 ppm. The present study is helpful for deepening the understandings to the basic physicochemical processes in the plasma jet, and also for promoting the existing and potential applications of He/H₂O plasma jet in biomedicine.

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