Low Temperature Plasma Jet for Application in Dental Bleaching

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We demonstrated a time modulated rf driven low temperature atmospheric pressure plasma jet used for dental bleaching. Conventionally, hydrogen peroxide (H_2O_2) is most commonly used for dental bleaching and has proven its efficiency over the years. However, there exit some dangerous side-effect risks while the concentration of hydrogen peroxide increases for the better bleaching efficiency. Otherwise, some other enhance methods using thermal treatment to accelerate the bleaching process, without critical control of emitting thermal energy and power, which might cause damage of tissues. In recently, the potential of low temperature atmospheric pressure plasma has been valued for applications in bio-medicine, includes the dental bleaching [1, 2], which greatly enhances safety and minimizes risk of treatments. In this article, a time modulated rf driven low temperature atmospheric pressure plasma jet was constructed for investigation of dental bleaching without hydrogen peroxide. The dental bleaching results as well as the dental tissue damage were compared with different plasma operating conditions and the characterization of plasma was carried out by using a home-made impedance meter and a commercial OES system. Some other critical experiment parameters such as treatment time and the gap between tooth and plasma jet were also adjusted and analyzed according to experiment design. After plasma treatment, the shade of teeth that stained by food coloring was change from B4 to B1 by using the Vitapan Classical shade guides and the dental pulp tissue was not damaged.

References

[1] H. W. Lee *et al.* Journal of Endodontics **35** 587–591 (2009)
[2] J. Pan *et al.* IEEE Trans. Plasma Sci. **38** 3143–3151 (2010)