INACTIVATION OF BACTERIA IN WATER BY A DIRECT-CURRENT, COLD, ATMOSPHERIC-PRESSURE He/O_2 PLASMA MICROJET

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Aqueous environments are susceptible to contamination by bacteria, protozoa and viruses, which are the root cause of various illnesses. These contaminations are usually treated by chemical methods. Recently, attempts have been made to inactivate bacteria in water with non-thermal plasmas using various approaches, e.g., a pulsed streamer discharge plasma or a gliding arc discharge plasma. A direct-current, cold, atmospheric-pressure He/O_2 plasma microjet (PMJ) sustained in a quasi-steady gas cavity in the liquid phase was used here to inactivate *Staphylococcus aureus* (*S. aureus*, suspended in a liquid). Effective inactivation (>98%) was achieved within the first 6 minutes of the PMJ treatment. The inactivation of the bacteria was verified by surface morphology examination (SEM) and by a LIVE/DEAD Baclight bacterial viability test (fluorescence microscopy). The overall pH and temperature of the liquid were observed to change from 7.5 to 6.2 and from 22^o C to 30^o C, respectively. A high concentration of OH was detected in the liquid by electron spin resonance (ESR) spectroscopy. End-on optical emission spectroscopy showed strong oxygen emission from the water.

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