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OH generation in a pulsed He plasma jet with water electrode[1]
SHUTONG SONG, CHUNQI JIANG, Frank Reidy Center for Bioelectrics Old Dominion University — The highly reactive hydroxyl radicals play a key role in various biomedical applications such as surface decontamination, wound disinfection and cancer treatment. This study investigated a needle-electrode pulsed helium plasma jet interacting with a water-covered ground electrode via electrical model and optical emission spectroscopy. The helium plasma jet driven by 6 kV pulses with varied pulse duration at 1 kHz was generated and impinged onto the water surface with an inter-electrode gap of 10 mm. An equivalent circuit, composed of a 6.3 pF capacitor which represented the capacitive jet device and in parallel with an adjustable resistor and capacitor in series for the plasma plume, can be used to model the plasma system based on the voltage-current waveforms. Optical emission spectroscopy revealed that total OH intensity along the plume increased with longer pulse duration in a range from 200 ns to 900 us. However, the OH energy yield, indicating the energy efficiency of OH production, is the highest at a pulse duration of 800 ns and 7.5 times higher compared to the second-highest at 900 us. Plume temperature were measured at different pulse durations and are further discussed assisted with modeling of OH ($A^2\Sigma$-$X^2\Pi$) emission spectra.

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