Contribution ID: **815** Type: **Poster**

4P10 - Statistical Quantization and Optimization of Cold Atmospheric Pressure Plasma Source for Destroying Bacteria and Biofilms through Design of Experiments Method

Thursday 27 June 2019 16:00 (1h 30m)

Cold atmospheric pressure (CAP) plasma has been shown to kill bacteria and destroy biofilms through reactive etch and sputter activity and could be used on industrial surfaces in the food processing industry where microbial contaminants are a source of food-borne illness. Our group has developed a parallel plate plasma source using embedded electrodes. Results have demonstrated that our source, operating at 20 kHz and 2-5 kV, can kill bacteria on various substrates with a Colony Forming Unit (CFU) reduction of 50% in <10 s. However, the operating mechanisms to achieve the most effective bacterial reduction have yet to be optimized. A 2-stage Design of Experiments (DoE) is being employed. A fractional factorial Factor Screening Experiment (FSE) is used to detect the statistical significance of seven experimental factors. The remaining factors will be put through a Central Composite Design capable of detecting non-linear interactions between factors within the design space. Experimental factors and variance ranges are as follows: discharge gap (0.1-3mm), covering electrode dielectric thickness (.2-1.8mm), AC voltage (2.5-5kV), proximity to substrate (0.3-5mm), exposure duration (2-18s), Argon gas flowrate (5-25 lpm) and Oxygen gas flowrate (0.35-5.64 lpm). We will measure the discharge current and the remaining CFU count as numeric responses and the bacteria removal as a binary response. These responses will show the optimal configuration of experimental factors to achieve the lowest CFU counts possible. These results will be presented.

Author: CROTEAU, Adam (Boise State)

Co-author: BROWNING, Jim (Professor)

Presenter: CROTEAU, Adam (Boise State)

Session Classification: Poster - Charged Particle Beams and Accelerators and High Energy Density Plasmas and Applications

Track Classification: 3.1 Plasma, Ion and Electron Sources