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3P66 - PLASMA SOURCE FOR KILLING BACTERIA AND BIOFILMS ON SURFACES

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Cold atmospheric pressure plasma (CAP) has been shown to kill or destroy bacteria and biofilm through reactive etch and sputter. Plasma can be used to debride wounds or to remove bacteria from food processing surfaces. Our parallel plate source operates at 20 kHz and 2-5 kV using Ar and O₂ working gasses. The device is fabricated from a Low Temperature Co-Fired Ceramic (LTCC) with a discharge gap of 0.5 mm, discharge widths from 2 mm to 5 cm, and metal AC electrodes embedded 35 μ m below the LTCC surface. A HV probe and current transformer are used to measure the operating voltage and discharge current, respectively. The source has been used to kill a variety of bacteria (Staph. aureus, E. coli, Salmonella, Listeria) residing in 2-day biofilms grown on glass, stainless steel, rubber, and plastic solid supports. Analysis of surviving Colony Forming Units (CFU) show that the device reduces cell survival by 50 % in <10 s, with a 3-log reduction in viable cells following 40-150 s exposure. The current device creates a single discharge line, so samples must be rotated during exposure. Stacked arrays containing 8 or more devices and embedded ballast resistors (100 k Ω) are being developed to allow full exposure of a large area with discharge uniformity. Finally, work is progressing on an optical imaging technique to identify stained biofilms for selective CAP treatment. These results will be presented.

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