Bioplasmas and Plasmas with Liquids

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BOOK OF ABSTRACTS

INDEX

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P-60

Gliding-arc discharge for microbial decontamination

Joanna Pawłat[1], Jarosław Diatczyk[1], Beyhan Gunaydin[2], Baran Onal Ulusoy[2,3], Michał Kwiatkowski[1], Piotr Terebun[1], Zuzana Kovalova[4], Mário Janda[4], Zdenko Machala[4], Karol Hensel[4], Mehmet Mutlu[2,5], Henryka Stryczewska[1]

[1]*Electrical Engineering and Computer Science Faculty, Lublin University of Technology, Lublin, Poland*
[2]*Engineering Faculty, Hacettepe University, Beytepe Campus, 06532 Ankara, Turkey*
[3]*Engineering Faculty, Çankırı Karatekin University, Uluyazı Campus, Çankırı, Turkey*
[4]*Department of Environmental Physics,Mlynská dolina F2, Bratislava, Slovakia*
[5]*Engineering Faculty, TOBB ETU Campus, Ankara, Turkey*

Compact, portable, gliding arc plasma device for decontamination of non-resistant surfaces and industrial materials like containers, trays, etc. at atmospheric pressure was tested.

Glide arc reactor consisted of 2 cupper or stainless steel wire electrodes of variable shape, thickness and length. Inter-electrode distance could be changed depending on processing gas and parameters of power supply system. Pure air, oxygen, helium, nitrogen, argon and their mixtures were used.

Temperature was evaluated at variable electrode diameters, types of gas precursors at several flow rates and distance between electrodes. Achieved temperatures ranged from 40 to 150°C. The effects of GAP system on the surface free energy and temperature of model surfaces, i.e. polyethylene terephthalate, stainless steel and silicon were measued with optical tensiometer and infrared thermometer, respectively. The decontamination effect of GAP system with operational temeratures below 50 °C was investigated on model surfaces artificially contaminated with *E.coli* and *S.epidermis*.

Recovery of test microorganisms from model surfaces were performed at media consisting of different surface active substances at variable concentrations (Tween 80 and Tween 20) at several time intervals. Optimum recovery media for *S.epidermis* and *E.coli* were 0.1 Tween 80- 5 min vortex and 2% Tween 80- 5 min vortex, respectively.

GAP treatment for 5 min. at 0.5 m^3/h gas flow rate, using nitrogen as precursor resulted in reduction of *S.epidermis* population on stainless steel, silicone and PET surfaces about 3.60, 3.02 and 2.67 log (cfu/mL), respectively. In the case of using air as precursor, 3.28, 1.63 and 3.65 log (cfu/mL) reductions were achieved on stainless steel, silicone and PET surfaces, respectively.

GAP treatment for 5 min. at 0.5 m^3/h gas flow rate, using nitrogen as precursor resulted in reduction of *E.coli* population on stainless steel, silicone and PET surfaces about 0.91, 3.82 and 2.00 log (cfu/mL), respectively. In the case of using air as precursor, 3.13, 3.12 and 2.55 log (cfu/mL) reductions were achieved on stainless steel, silicone and PET surfaces, respectively.

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