Constellation Ballrooms C, D, E, and F
8:00 Monday, June 28, 2004

Chairperson: Karl Schoenbach,

Plenary Talk PL1:

Non-Equilibrium Plasma-Based Sterilization: Overview, State-of-the-Art, and Challenges

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Low temperature, high pressure, non-equilibrium plasmas are now routinely used in several material processing applications, and in some cases are competing with low-pressure plasmas in areas where these have historically been dominant. Etching and deposition are examples of such applications. In the past two decades, high-pressure plasmas have also played an enabling role in the development of excimer VUV & UV sources [1], plasma-based surface treating devices [2], and in environmental technology such as the cleaning of flue gases [3]. The use of these types of plasmas in emerging applications seems to go unabated. Amongst the novel applications, the use of atmospheric pressure "cold" plasmas in the biomedical field is experiencing a heightened interest from both the plasma science research community and the biomedical research community. This is due to newly found applications in promising medical research such as electrosurgery [4], tissue engineering [5], surface modification of bio-compatible materials [6], and the sterilization of heat-sensitive medical instruments [7]. In this talk, first a brief overview of some biomedical and environmental plasma applications will be presented. Then, an in-depth coverage of plasma-based sterilization/decontamination research will be given. Description of several devices will be presented along with their performance as biological sterilizers. The role of each plasma-generated agent in the destruction of the cells of microorganisms will be discussed. To conclude, present challenges and future prospects of the biomedical applications of plasmas will be outlined.

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[2] F. Massines et al., In Proc. Int. Conf. Gas Discharges & their Applications, Swansee, U.K., (1992), pp.730-733.
[3] E. Smulders et al., IEEE Trans. Plasma Sci., Vol. 26, No. 5, pp. 1476-1484, (1998).
[4] K. Stalder, In Proc. Gaseous Electr. Conf., p. 16, 2003.
[5] E. A. Blakely et al., In Proc. IEEE Int. Conf. Plasma Sci., (2002), p. 253.
[6] F. S. Sanchez-Estrada et al., In Proc. IEEE Int. Conf. Plasma Sci., (2002), p. 254.
[7] M. Laroussi, IEEE Trans. Plasma Sci., Vol. 30, No. 4, pp. 1409-1415, (2002).