ICoPESA 2022

Lecture by

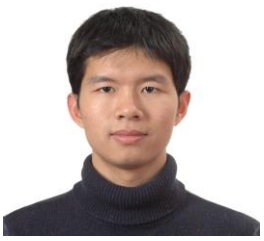
Shuqun Wu, Xinpei Lu, Chaohai Zhang

Shuqun Wu, Nanjing University of Aeronautics and Astronautics

Atmospheric pressure cold plasma jets for biomedical applications

Atmospheric-pressure plasma jets (APPJs) generate cold plasma plume in the open space, rather than in a narrow space (like in dielectric barrier discharges). This characteristic of APPJs allows the direct plasma treatment of objects with complex 3D surface topography. In other words, there is no size limitation of objects during APPJ treatment. Moreover, APPJs generate numerous reactive species (such as ROS and RNS) and the gas temperature of the plasma is close to room temperature, which are well suitable to the plasma treatment of cells, skins, tissues, and biomaterials, etc. That's why APPJs are extensively investigated for plasma medicine. Typically in APPJs, an high ac voltage or pulse voltage with several kHz is applied, and noble gas (such as helium, argon, and neon) is injected into a dielectric tube and flushes into the ambient air. Plasma is firstly generated inside the tube and then propagates along the flow of noble gas, and finally terminates at several centimeters away from the nozzle. The plasma plume in the open space looks continuous by naked eye. By using intensified charge-coupled camera device (ICCD) with exposure time of several nanoseconds, the plasma plume is not continuous but consists of fast propagating bullet-like plasma volumes. The propagating velocity of "plasma bullets" is over 10^4 m/s, which is much faster than the gas flow. This talk mainly focuses on the APPJs and its biomedical applications, such as wound healing, bacteria decontamination, and root canal treatment.

About the author



Shuqun Wu received the Ph. D degree in electrical engineering from the Huazhong University of Science and Technology, Wuhan, China, in 2015. He visited Princeton University from 2017 Nov to 2018 Nov as a visiting scholar. From 2020 to present, he has been a full Professor with the College of Automation Engineering, Nanjing University of Aeronautics and Astronautics, China. He is an IEEE Senior member, an NPSS member, a senior member of China Electro-technical Society. He also served as a guest editor of the journal of Plasma Science technology. He was invited to give talks at several conferences, including ICOPS, IWPEEA, CIEEC, and CES annual conferences. He has authored or co-authored over 50 scientific articles. H-index is 23. His current research interests include high-pressure plasma, pulsed power technology and their applications in biomedicine and aerospace.