

GEC16-2016-000459

Abstract for an Invited Paper
for the GEC16 Meeting of
the American Physical Society

Control of Reactive Species Generated by Low-frequency Biased Nanosecond Pulse Discharge in Atmospheric Pressure Plasma Effluent

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The control of hydroxyl radical and the other gas phase species generation in the ejected gas through air plasma (air plasma effluent) has been experimentally studied, which is a key to extend the range of plasma treatment. Nanosecond pulse discharge is known to produce high reduced electric field (E/N) discharge that leads to efficient generation of the reactive species than conventional low frequency discharge, while the charge-voltage cycle in the low frequency discharge is known to be well-controlled. In this study, the nanosecond pulse discharge biased with AC low frequency high voltage is used to take advantages of these discharges, which allows us to modulate the reactive species composition in the air plasma effluent. The utilization of the gas-liquid interface and the liquid phase chemical reactions between the modulated long-lived reactive species delivered from the air plasma effluent could realize efficient liquid phase chemical reactions leading to short-lived reactive species production far from the air plasma, which is crucial for some plasma agricultural applications.