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76th Annual Gaseous Electronics Conference

Monday–Friday, October 9–13, 2023; Michigan League, Ann Arbor, Michigan

Session FF2: Agricultural and Environmental Applications

10:00 AM–11:30 AM, Friday, October 13, 2023

Room: Michigan League, Koessler

Chair: Nils Hansen, Sandia National Laboratories

Abstract: FF2.00005 : Use of atmospheric pressure plasma reactivity in water treatment for agricultural applications*

11:00 AM–11:30 AM

← Abstract

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Non-thermal Plasmas (NTP), formed at atmospheric pressure, produce rich gas phase chemistry of Reactive Oxygen and Nitrogen Species (RONS). In a contact with a liquid target, NTPs induce production of different long-lived RONS species inside the liquid. NTPs can be employed for creation of plasma activated water (PAW) or for destruction of pollutants dissolved in water. In recent years both aspects are being developed as parts of a new field of plasma agricultural applications. The way to tailor the RONS concentrations is by adjusting of the plasma chemistry in the gas phase, the type of water and sample vessel properties. We will present results of plasma treatments of distilled and tap water using an atmospheric pressure plasma jet with pin electrode operating with addition of noble gas (He, Ar). The idea was to feature comparison of PAW properties obtained with different plasma system parameters. Produced PAW was used for treatments of different seeds and plants with an attention on linking the plasma properties with effects on treated plant material. On the other hand, the multi-pin jet was used for decontamination of water polluted by organic dyes and pharmaceuticals. This plasma source was designed based on a single-pin unit and obtained results can provide an insight into scaling up the plasma reactivity which is a necessary step for any agricultural application. We also tested variation in the efficiency of the plasma decontamination by adding recirculation of the contaminated sample. The effective treatment surface parameter proved to be significant for regulation of the decontamination level.

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