10th Central European Symposium on Plasma Chemistry
21st International Conference on Plasma Physics and Applications

Bucharest, Romania, 1-5 September 2025

Book of Abstracts

Edited by: Daniela Dobrin, Monica Magureanu, Bogdana Mitu, Veronica Satulu

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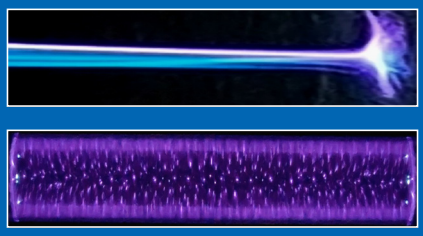

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Stability of reactive species produced in plasma activated water by various atmospheric pressure plasmas

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Non-thermal plasma and plasma-activated water (PAW) are used in a vast variety of applications because of their special components, especially reactive oxygen and nitrogen species (RONS). PAW is mostly used in agriculture and food safety [1], bio-medical application [2] and surface treatment and modifications [3]. Although extensive research has been carried out on the application of PAW [4], but it is crucial to know the stability and temporal evolution of reactive species in PAW.

In this study, both tap, and deionized (DI) water are used to produce PAW with three different plasma setups: Transient Spark (TS) batch water treatment, Transient Spark-Electrospray (TS-ES), and Fountain Dielectric Barrier Discharge (FDBD). TS and TS-ES work in pin-to-plane geometries, using DC high voltage. The spark pulse frequency is fixed at 1 kHz for both, with a gap distance of 1 cm. 0.5 ml/min flow rate was set for TS-ES, while 10 ml was treated for 10 min in batch TS. For FDBD we used a neon-sign AC high voltage power supply with 15 kV pk-to-pk and 20 kHz and 1 L of water was circulated during 20 min. PAW characteristics, including the RONS (H_2O_2, O_3, NO_2^- and NO_3^-) concentrations and pH, electric conductivity (EC), oxidation reduction potential (ORP), temperature, and total dissolved solids (TDS), were investigated in short and long time after plasma treatment. For a short time, the behavior of physiochemical characteristics of water was measured in the first 24 hours (0, 2, 4, 8, 12, and 24 hours) after treatment and 1, 2, 4, 8, 16, and 30 days after treatment for a long-time stability. The results show that RONS in naturally buffering tap water are more stable than in DI water, however, most of RONS disappear after 10 days in tap water. All reactions between RONS occur faster in the acidified DI. NO_3^- is the only species that stays in Tap and DI water after a long time. The findings that were acquired from this research are crucial for the post-production use of plasma-activated water in agriculture and disinfection.

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