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AAPPS-DPP2021 Plenary Lecture

Novel Atmospheric Pressure Non-Equilibrium Discharges: Plasma Physics, Scaling Up, and Applications for Material Treatment, Agriculture, Food Processing, and Biomedicine.

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Abstract:

Non-equilibrium atmospheric pressure plasma sources are in focus of modern plasma physics and engineering mostly because of their intriguing physics and significant widening of application areas from plasma catalysis to plasma biology and medicine. This presentation is going to be mostly focused on novel experimental and modeling results on physics, chemistry, scaling up and applications of two types of discharges: nanosecondpulsed uniform dielectric barrier discharge (DBD) and gliding arc discharge stabilized in reverse-vortex flow (GA Tornado).

Regarding, the DBD plasma, special attention is going to be paid to investigations of the discharge uniformity depending on the system parameters, which is especially important for plasma medicine. Regarding the GA Tornado plasma, special attention is going to be paid to investigations of the non-equilibrium gliding arc scaling up without losing the non-equilibrium regime of the discharge, as well as analysis of theoretical and engineering electric power limits in scaling up of the GA Tornado, including those for the underwater operational regimes of these plasma discharges.

Between novel atmospheric pressure plasma applications, it is planned to discuss plasma cosmetics and treatment of cancerous and precancerous dermatological lesions, plasma treatment of large volumes of water in hydroponics, PFOS/PFOA suppression, as well plasma production of novel energetic materials.