

Seminar

Institute for Plasma Research

Title: Study of Plasma Activation of Water and its applications in Antimicrobial and Agricultural activities

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Time: 10.30 AM

Venue: Seminar Hall, IPR / Join the talk Online:
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Abstract

Plasma activated water (PAW) is known for its numerous applications in the field of pathogens (bacteria, fungi, virus, and pest, etc.) killing, food preservation, seeds germination and plant growth, etc. These applications of PAW are possible due to various reactive oxygen-nitrogen species (RONS) (NO_3^- ions, NO_2^- ions, H_2O_2 , dissolved O_3 , etc.) present in it.

In the present work, the design and development of a plasma device to produce PAW is presented. Moreover, we studied the effect of design parameters of plasma device and process parameters of PAW on physicochemical properties and RONS concentration of PAW. The obtained results showed that the plasma-water treatment time and discharge power play a significant role in controlling the physicochemical properties and RONS concentration of PAW. Also, the knurling of ground electrode, quartz as dielectric material, wire spiral as power electrode, and copper as material of construction substantially enhances the properties of PAW. After obtaining optimum configuration of plasma device, a multiple plasma device setup is designed and developed to produce higher volume of PAW. At obtained optimum parameter, we study the bactericidal and fungicidal efficacy of PAW and its mechanism. The results show PAW can kill a high concentration of bacterial and fungi colonies and retains this efficacy for the long term. PAW also has the potential to improve the germination of seeds and plant growth. Our study of “PAW effect of pea (*Pisum sativum*) seeds germination and plant growth” shows PAW significantly improves the germination rate of seeds. This is due to PAW treatment with seeds removing the hydrophobic wax structure and making the seeds surface more hydrophilic. Hence, we observe a higher length of the grown plant after PAW treatment compared to control.

In conclusion, we can say that PAW has the potential to be used as a chemical-free alternative for various disinfection purposes (bacteria, fungi, virus, and pest, etc.). Also, it has the enormous potential to be used in the medicine, agriculture, and food sector.
