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THE INFLUENCE OF SURFACE HUMIDITY ON DISINFECTION USING COLD PLASMAS

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Increased risks due to outbreaks of foodborne viruses and bacteria give us strong motive for the development of a viable non-thermal technology for the disinfection of foods and their contact surfaces. Plasma discharges occurring in the presence of oxygen and nitrogen generate an abundance of reactive oxygen and nitrogen species (RONS) at close to ambient temperatures. With minimal requirements for addition of any chemicals, disinfection using atmospheric pressure air plasmas could be a sustainable and green non-thermal technology.

This work attempts to study the dependence of the biocidal activity of plasma sources on surface humidity of the sample used. Cold plasmas at atmospheric pressure were employed for in vitro treatment of pathogens spiked on stainless steel surfaces. The discharge effluent was used to treat the samples at both dry and wet surfaces.

Plasma treatment was ineffective against dry samples. Similar humidity effect has been found in food science where lipid oxidation rates are triggered only beyond a threshold level of water activity. While wet virus samples were much more susceptible to plasma treatment, the effect was strongly dependent on the amount of water on the surface. An analysis of the transport of long-lived reactive species into aqueous phase, eventually responsible for microbial inactivation, will be presented. The present findings suggest that the control of sample surface humidity is crucial for effective and reproducible plasma-based disinfection.

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