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Perspectives on atmospheric pressure air plasma for chemical and microbial decontamination across the food production sector.

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Microbial contamination is one of the greatest challenges faced by the food industry. Biological contaminants, such as bacteria and fungi, cause significant food waste, economic losses to food producers, and serious illnesses to over 2 billion people each year. Low temperature plasmas have shown great promise for the decontamination of microorganism and other contaminants, yet uptake of the technology across the food production sector has been limited due in part to the complexity of the underpinning physicochemical processes at play.

This contribution will focus on recent efforts to develop plasma technology for use across the food production sector, focusing on the decontamination of food contact surfaces and food products. Results from the application of advanced experimental diagnostic techniques, such as laser induced fluorescence, and computational modelling, are used to shed light on the transport of key plasma-generated Reactive Oxygen and Nitrogen Species (RONS) to a downstream target. It will be show that the composition and concentration of RONS arriving at a target are heavily dependent on the specific design parameters of the plasma generating source, opening the possibility to enhance mass transport and therefore increase application efficacy.

Several topical examples of where the technology has shown promise across the sector will be discussed, including the continuous and in-line decontamination of conveyor belts and the elimination of fungal species, including their toxic secondary metabolites. Ultimately it is shown that plasma technology is capable of meeting industry requirements in terms of both efficacy and treatment time.

Finally, the future perspectives on the implementation of plasma technology across the food supply chain will be discussed; highlighting the remaining challenges that must be overcome to realise its full potential across the sector.

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