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Optical Emission Spectroscopy Diagnostics of Cold Plasmas for Food Sterilization

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ABSTRACT

There is a growing need for economical, effective, and safe methods of sterilizing fresh produce. The most common method is a chlorine wash, which is expensive and may introduce carcinogens. High voltage cold atmospheric pressure plasmas are a promising solution that has demonstrated a germicidal effect; however, the responsible chemical mechanisms and reaction pathways are not fully understood. To elucidate this chemistry, we used optical emission spectroscopy to measure the species produced in the plasma generated by a 60 Hz pulsed dielectric barrier discharge in a plastic box containing various fill gases (He, N₂, CO₂, dry air, or humid air). In addition to estimating chemical species concentrations, we performed preliminary calculations of electronic, vibrational, rotational, and translational temperatures.

KEYWORDS

Cold plasmas, food sterilization, optical emission spectroscopy, dielectric barrier discharge, high voltage