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3P64 - Time-resolved ATR-FTIR to Reveal inactivation Kinetics of E. coli by Atmospheric DBD Plasma

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A highly effective bactericidal dielectric barrier discharge (DBD) system with pulse power supply is established to inactivate Escherichia coli (E. coli) in solution. A time-resolved, pseudo - in situ method based on attenuated total reflectance Fourier transform infrared (ATR-FTIR) is developed to determine the molecular changes occurring in E. coli during the plasma treatment under different applied voltages. Results show that the germicidal effect is strongly correlated to the reduction and structural changes of macromolecules in bacteria including lipids, proteins and DNA. Damage to bacterial cell membrane and cell wall is observed. Morphology alteration revealed by Transmission Electron Microscopy (TEM) suggests leakage of cellular inclusion, consistent with the FTIR results. This work is supported by the National Key Research and Development Program under contract 2017YFC1200404

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