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Electric field analysis of different compact electrodes for high voltage pulsed electric field applications in liquid food

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A 2D and 3D electromagnetic simulation has been performed on compact electrode designs aimed to obtain higher electric field distribution between the high voltage and ground electrode, which ensures high bacterial inactivation in liquid food. The electric field simulations are performed for applied voltages of 1kV to 5kV. For the round edged design, the transmembrane potential of 1V is achieved with the spherical cell, modeled between the high voltage and the ground electrode. And for the novel torus tube design, simulation is performed and the electric field values are taken based on deciding the location of bacteria, between the two electrodes. The dimensions of the electrodes are maintained in mm and cm suitable for laboratory scale, continuous pulsed electric field treatments. In both the designs, efforts have been put forth on simulation to achieve higher electric field application between two electrodes. From the observed results, it is understood that greater electric field application between the two electrodes is achievable even using small efficient electrode designs, which in turn assures i) A greater bacterial inactivation in the liquid food and ii) A compact pulsed electric field experimental prototype.

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