
Biological Applications Using Pulsed Power Technology

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Pulsed power is a unique technology which can result in extreme physical phenomena and is able to control its degree of output signals. Due to this characteristic, it enables a wide variety of applications which cover the solids, liquids, supercritical fluids, gases, and bioelectrics fields. Another unique characteristic of pulsed power technology is possible to apply high pulsed electric fields or discharge plasma in liquid phase: not only in fresh water, but also in highly conductive liquids such as sea water.

Bioelectrics refers to the use of pulsed power, non-thermal plasmas in gases or liquids and shockwaves, to give novel physical stresses to biological cells, tissues and/or organisms as well as bacteria. Bioelectrics is an interdisciplinary academic field over physics, chemistry, biology, medical science, agriculture, environmental, mechanical and electrical engineering, and is expected to open up new science and technology.

By controlling the degree of electrical stimulations using pulsed power, it is possible to either inactivate biological targets or keep them alive and activate their functions. Examples of inactivation are given as: sterilization of liquids, treatment of algae and marine harmful organisms, growth inhibition of plants. On the other hand, more delicate stress control enables the activation of living organisms such as transcriptional activation of genes, substance transduction into cells, growth enhancement of plants. Detailed introductions will be presented at the conference.