3rd World Congress on Electroporation and Pulsed Electric Fields in Biology, Medicine and Food & Environmental Technologies (WCE2019), Toulouse, France, September 3-6, 2019

Protein recovery assisted by pulsed electric field treatment from microalgae *Chlorella vulgaris* and *Artrospira platensis*

Christian Gusbeth, Daniel Scherer, Wolfgang Frey, Georg Müller,

Karlsruhe Institute of Technology (KIT)
Institute of Pulsed Power and Microwave Technology (IHM), 76344 Eggenstein-Leopoldshafen, Germany

One of the major global challenges of the 21st century is the sustainable supply of the growing world population with food, raw materials and energy. Microalgae cultivated outside farmland under photoautotrophic conditions are a suitable source of renewable raw biomass. By adequate processing of microalgae biomass, products with unique properties can be used as food and feed supplements, in cosmetics and agriculture. The best known examples are dyes astaxanthin, phycocyanin and ß-carotene as well as polyunsaturated fatty acids (PUFA). In spite of this appeal the worldwide production of dry microalgae biomass is only few thousand tonnes per year. This is due to the high investment costs in photo-bioreactors (PBR) and the high energy consumption during down-stream processing of microalgae biomass. To reduce these costs, new technologies and processing methods are required. A suitable alternative to mechanical disruption approaches is the pulsed electric field (PEF) treatment. The extraction efficiency is lower compared to mechanical disruption methods, but the biomass separability is maintained since the morphology of the cells barely changes.

In this study we evaluated the potential of PEF treatment for protein and phycocyanin recovery from *Chlorella vulgaris* and *Arthrospira platensis* respectively. It is assumed that irreversible electroporation of the cell membrane and the subsequent increased permeabilization are the main effects which allows proteins and other ingredients to pass through the membrane. We observed in our study that efficient protein extraction after PEF treatment requires an incubation step and the progress and kinetics of this outflow is dependent on the biomass concentration and the incubation temperature. The impairment of the molecular outflow at higher temperature (50 °C) and at higher biomass concentration are hints for two different effects. Beside diffusion in a chemical gradient a second biological, enzyme-regulated process within the PEF-treated biomass that facilitates release of proteins from the cells, was considered. This presentation will give an overview about the various factors, such as the post PEF treatment incubation parameters, which have an impact on protein release, as it could be possible to optimize the incubation in order to obtain higher yields.