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sulting signal can be easily quantified using a flow cytometer. By application of PEF treatment with very low energies an equilibrium of dead and live cells can be reached. Different factors related to PCD are then inhibited and the biological response after PEF treatment investigated.

PO-087

Electroextraction of proteins and other biologically active compounds from brewer's and baker's yeasts

Bojidar Galutzov, *Valentina Ganeva*, Boyana B Angelova, Vasilij V Goltsev, Miroslava M Zhiponova
Sofia University "St. Kl. Ohridski", Biological faculty, Biophysics and Radiobiology, Bulgaria

Yeasts are rich in proteins, vitamins, antioxidants and other biologically active compounds. The main problem for their utilization as a source of proteins for human food is the indigestible cell wall and the high nucleic acid content. In the present study, we evaluated the applicability of PEF treatment for production of protein extracts and other biologically active compounds from commercial pressed backer's yeast, and dry and spent brewer's yeast. The cells were treated with monopolar rectangular pulses using a continuous flow system (flow rates up to 130 ml/min). The release of macromolecules and low molecular weight components depends on the percentage of irreversibly permeabilized cells. The incubation of electropermeabilized cells in water leads to liberation of small molecules only – 95 % of the free amino acids and low molecular UV absorbing components; 80 % of water soluble vitamins, 50 % of the total antioxidant activity and polyphenols. The release of macromolecules (proteins and nucleic acids), takes place only after dilution and incubation of the permeabilized cells in a buffer with a suitable pH. Maximal yield (90 % of total soluble protein) was obtained when over 95% of the cells were irreversibly permeabilzied. At these conditions the outlet temperature for backer's yeast was in the range of 46–49oC, and for brewer's yeast 44–46oC. No protein denaturation occurred as verified by enzyme activity measurements. Postpulse incubation at 30oC in presence of Dithiothreitol (1-2 mM) enhanced significantly the rate of protein liberation. The protein concentrates, obtained by ultrafiltration showed a reduced nucleic acid (NA) content (protein/NA ratio – 100/4). This is due first to the retention of a part of NA inside the cell, and to a NA hydrolysis during postpulse incubation.

PO-088

Oil extraction from microalgae by nanosecond pulse electric field induced underwater shock waves

Bahareh Hosseini[1], *Alexis Guionet*[2], *Hamid Hosano*[1]
Kumamoto University, Bioelectrics Department, Japan
National Institute for Material Science, Japan

Consumption of fossil fuel produces CO2, which cause global warming that recently considers as a major problem in the world. Biofuel production as a sustainable source of green energy is considered as promising complements to petroleum in order to prevent environmental problems. In this regard, microalgae can be one of the best options since other plant resources may be used for human consumption, using them for producing biofuel may cause an increase in their price. However, there are several challenges to extract oil from microalgae, e.g., high energy consumption, chemical solvents, and algae culture destruction; which should be addressed by new approaches. This study suggests two pulsed power based physical methods for hydrocarbon extraction from microalgae: nanosecond pulse electric fields (nsPEF) and their induced underwater shock waves. Botryococcus braunii with high hydrocarbon production potential was used as microalga model. For nanosecond pulse electric fields experiments, 20 to 87 kV/cm electric fields with 80 to 200 ns pulse duration, with different pulse repetition frequencies and pulse numbers were applied. Underwater shock waves experiments were conducted by applying up to 1000 shock waves, generated by nanosecond pulse electric discharge in water. Fluorescence microscopic observation and image and chemical assesments were performed for analysing the samples, understanding the extraction mechanisms, and comparing the outcomes. According to the results, both pusled power approaches can be used as high efficincy physical methods for extracting oil from Botryococcus braunii.

PO-089

Enhancement of antibacterial effect of plasma activated water with pulsed electric field

Robin Menthéour, Barbora Tarabova, Zdenko Machala
Comenius University, Faculty of Mathematics, Physics and Informatics, Slovakia

Transient Spark discharge with nanosecond high energy pulses generates a cold plasma operated in atmospheric air with water electrospray and demonstrated strong and fast antimicrobial effects when bacteria are directly exposed to the discharge. Transient spark can also activate water which keeps its antibacterial properties for a few hours after plasma treatment. However, the antibacterial effects are weaker than in the direct exposure. Short and long lifetime reactive species, electrons, UV, heating and electric field generated by the plasma are good candidates to explain this difference but their respective importance and the coupled effects between them are not well understood. Our preliminary experiments are focused to understand the role of strong pulsed electric fields in the overall plasma action to bacterial cells and the effect of electroporation induced by high electric field in combination with chemical effects of the plasma activated water.

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PO-090

Synergy effects of pulsed electric fields during the process of cryoconcentration

Iurie Bosneaga[1], Elena Agarwal[2]
[1]Institute of Applied Physics, Moldova, Republic of
[2]University Dimitrie Cantemir, Moldova, Republic of