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PRODUCTION OF BIOFUELS BY MICRO-, LAB-, PILOT- AND INDUSTRIAL SCALE BASED BIOCATALYTIC PROCESSES

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The need for the production of biofuels from various renewable sources is becoming increasingly interesting especially as the availability and accessibility of fossil fuels is significantly declining. Biodegradability, low pollution emissions and non-toxicity of raw materials are some properties making biogas, biodiesel and bioethanol more environmentally friendly fuels.

Solid-state fermentation could be a suitable technology for the production of value-added products by utilization of the renewable waste materials, which makes it also economically feasible. So far, this technology was used for production of enzymes, organic acids, mushrooms, flavour and aroma compounds, pigments, polysaccharides, hormones, human food and animal feed. Different type of bioreactors have been developed and successfully used for solid-state fermentation of broad range of substrates and in production of value-added products. Solid-state fermentation will be demonstrated as part of anaerobic degradation on lab-, pilot- and industrial-scale of several waste materials such as brewer's spent grain, whey and cow manure, and corn silage and cow manure, respectively.

The application of different microreactor systems in intensification of the biodiesel production process is widely studied. However, previous studies of the application of microreactor technology in the production of biodiesel were limited to the use of chemical catalysts. Mild reaction conditions, absence of by-products, reusability, simple separation and purification of the resulting biodiesel as well as lower energy consumption are some of the many advantages that make the enzyme lipase – a biocatalyst – a better choice than traditional chemical catalysts in the process of biodiesel production. Different microreactor systems utilising a commercially available lipase and a lipase produced by solid-state fermentation were used for transesterification of fresh and waste cooking oil while biodiesel was separated using integrated microseparation unit.

Selected examples are clear demonstration of environmentally friendly and economic technologies used for efficient production of biofuels on micro-, lab-, pilot- and industrial scale.

Keywords—anaerobic digestion, biofuels, microreactors, solid-state fermentation

Biography

Bruno Zelic received his PhD in chemical engineering in 2003 at University of Zagreb. From 2012 he is full professor at the Faculty of Chemical Engineering and Technology, University of Zagreb. His research interests are in the field of implementation of microreactor technology into biotechnology and biofuels production. More than 80 scientific and professional publications, 2 patents, and more than 60 oral and poster presentations on the international conferences present his scientific work. Bruno Zelic was dean of the Faculty of Chemical Engineering and Technology, University of Zagreb from 2013 to 2017. He is Editor-in-Chief of Chemical and Biochemical Engineering Quarterly journal.

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