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Integrated process of unconventional biodiesel production reusing glycerol: Techno-economic and environmental impact evaluation

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Biofuels are considered an important alternative to fossil fuels due their potential to reduce the greenhouse gas emissions that are responsible by the global warning. Particularly biodiesel is very attractive; however, its production increases are resulting in considerable amount of glycerol whose reuse will become an urgent issue. Thus, the aim of this work was to develop an integrated process for the biodiesel with glycerol reuse. This process considers the attained residual glycerol as carbon source to produce simultaneously by submerged fermentation a biocatalyst (whole cells) with intracellular lipase activity behavior for biodiesel production by enzymatic route and Single Cell Protein (SCP) requested as a component for animal feed formulation. Basically, the developed process began with a chemical route, but after generation of sufficient glycerol amount, "whole cells" with intracellular lipase activity are produced and then it is driven to enzymatic route. In addition, this process consists of two transesterification steps integrated to purification and fermentation steps that use the formed glycerin to produce biomass to be employed as SCP and/or biocatalyst in a novel fermenter assisted by electromagnetic field. A techno-economic and environmental impact evaluation, based on index cost for chemical plant design and Waste Reduction Algorithm (WAR), respectively, were carried out seeking to reduce the impacts generated by this process. The attained results were strongly dependent on the feedstock used, government subsidies policies and novel technologies, among others aspects. Consequently, the integrated process was the best alternative comparatively with the conventional biodiesel production.

Biography

Victor Haber Perez attained his PhD degree in 2002 in Chemical Engineering (in the Development of Biotechnological Processes area) at the State University of Campinas Brazil. Currently he is working as Associate Professor at the State University of the Northern of Rio de Janeiro (UENF). He has experience in the biofuels production by unconventional methods and bio-products production for chemical and food industry. Among 2012-2014 he accomplished as a Visiting Scholar in the Biological System Engineering at the Washington State University in thermochemical biomass transformation problems.

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