BIOTECHNOLOGY OF LIGNOCELLULOSICS FOR THE PRODUCTION OF SECOND GENERATION BIOETHANOL WITHIN THE CONTEXT OF BIOREFINERY

Nei Pereira Jr.

Department of Biochemical Engineering - School of Chemistry, Federal University of Rio de Janeiro, nei@eq.ufrj.br

The dependence for oil remains as the most important factor that affects the world-wide distribution of wealth, the global conflicts, and the quality of the environment. The population growth and the associate demand for fuels and goods have intensified Research and Development for the use of renewable resources in substitution to the fossil sources, particularly the abundant agricultural residues of lignocellulosic composition. The utilization of such residues is of great interest since their generation does not compete with the use of land for food production nor is there necessity of expanding the agricultural land for feedstock production. In this subject, ethanol is still the chemical substance that has had the technology of production more investigated. However, intensive efforts and great investments have been made in the direction of diversifying the use of these abundant residues, within the concept, of what has been called of ***BIOREFINERY***. To be used as feedstock, these materials have first to undergo pretreatment followed by hydrolysis procedures (chemical or enzymatic) of the polyssacharide portions to produce their corresponding carbohydrates, which will be used as building blocks for chemical and biochemical conversion technologies. Consensually, the pretreatment more indicated is the thermochemical that aims at to the solubilization and hydrolysis of the HEMICELLULOSE. Concerning the CELLULOSE utilization, the trend is to hydrolyse it by enzymes as for avoiding the production of toxic substances, which would be generated by chemical hydrolysis (mainly hydroxymethylfurfural and aromatics). However, cellulases are inhibited by their main products of hydrolysis (cellobiose and glucose). To circumvent this problem a conversion process needs to be associated to the enzymatic step (*Simultaneous Saccharification and Fermentation Process*). The integration of these hydrolysis stages (from hemicellulose and cellulose) generates hydrolysates with a variety of sugars (glucose, xylose, arabinose, galactose, manose), which must be promptly consumed by recombinant microorganisms, due to the metabolic diversity that can obtained with these biological agents (*Simultaneous Saccharification and Co-Fermentation Process*). Integrated research and the development of biological and chemical processes from lignocellulosic residues have advanced speedily and commercial plants for the exploitation of such feedstocks are to become a reality. Brazil is in sufficiently privileged position to assume the leadership in the integral exploitation of “residual biomasses” and to follow its natural vocation for developments in this area. The moment was never so propitious (price of the oil barrel ≅ US$100).