ENHANCEMENT OF THE ENZYMATIC HYDROLYSIS OF PAULOWNIA WOOD USING NONIONIC SURFACTANT

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Abstract

The abundance of lignocellulosic biomass from various industries provides a great potential feedstock for the production of value-added products. This lignocellulosic materials can be enzymatically hydrolyzed into sugars for the production of biofuels and biomaterials. However, the presence of lignin is inhibitory, becoming a major obstacle for enzymatic hydrolysis of lignocellulosic materials conducted in high solid loading. This is because the lignin acts as a protective barrier for cellulose and, thus, restricts the accessibility of the enzyme to the cellulose. Addition of surfactants, polymers, and non-catalytic proteins can improve the enzymatic hydrolysis of lignocellulosic materials by blocking the exposed lignin surfaces.

In this work, the optimization of enzymatic hydrolysis of Paulownia wood was tested, evaluating the influence of: i) autohydrolysis pretreatment under non-isothermal conditions (T_{MAX}: 210ºC, 220ºC and 230ºC), ii) solid loading (Consistency: 10, 13 and 16 %), iii) enzyme substrate ratio (ESR: 8, 12 and 16 UPF/g Paulownia), and iv) the addition of nonionic surfactant Tween 20 (0, 1.5 and 3 g/L). The enzyme employed was Cellic CTec2 (Novozymes) with an enzyme activity of 160 UFP/mL.

This work suggested that autohydrolysis pretreatment could improve the enzymatic hydrolysis significantly and the addition of Tween 20 could reduce the hydrolysis time and enzyme dosage.