World Academy of Science, Engineering and Technology
International Journal of Biological and Ecological Engineering
Vol:9, No:12, 2015

Effect of Anion and Amino Functional Group on Resin for Lipase Immobilization with Adsorption-Cross Linking Method

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Abstract : Lipase is one of biocatalyst which is applied commercially for the process in industries, such as bioenergy, food, and pharmaceutical industry. Nowadays, biocatalysts are preferred in industries because they work in mild condition, high specificity, and reduce energy consumption (high pressure and temperature). But, the usage of lipase for industry scale is limited by economic reason due to the high price of lipase and difficulty of the separation system. Immobilization of lipase is one of the solutions to maintain the activity of lipase and reduce separation system in the process. Therefore, we conduct a study about lipase immobilization with the adsorption-cross linking method using glutaraldehyde because this method produces high enzyme loading and stability. Lipase is immobilized on different kind of resin with the various functional group. Highest enzyme loading (76.69%) was achieved by lipase immobilized on anion macroporous which have anion functional group (OH⁻). However, highest activity (24,69 U/g support) through olive oil emulsion method was achieved by lipase immobilized on anion macroporous-chitosan which have amino (NH₂) and anion (OH⁻) functional group. In addition, it also success to produce biodiesel until reach yield 50,6% through interesterification reaction and after 4 cycles stable 63.9% relative with initial yield. While for Aspergillus, niger lipase immobilized on anion macroporous-kitosan have unit activity 22,84 U/g resin and yield biodiesel higher than commercial lipase (69,1%) and after 4 cycles stable reach 70.6% relative from initial yield. This shows that optimum functional group on support for immobilization with adsorption-cross linking is the support that contains amino (NH₂) and anion (OH⁻) functional group because they can react with glutaraldehyde and binding with enzyme prevent desorption of lipase from support through binding lipase with a functional group on support.

Keywords : adsorption-cross linking, immobilization, lipase, resin
Conference Title : ICBBE 2015 : International Conference on Biological and Bioprocess Engineering
Conference Location : Sydney, Australia
Conference Dates : December 10-11, 2015