SYNTHESIS of S-PENTANOL via-LIPASE CATALYZED KINETIC RESOLUTION in SUPERCRITICAL CARBON DIOXIDE

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Abstract

Enzymatic kinetic resolution method has gained much attention because of high enantioselectivity of enzymes, carring out of reactions in mild conditions for production of enantiomerically pure compounds. Also in this method, alternative solutions are improved to avoid the use of bulk organic solvents, having more attention in applications of biocatalysts, are improved because organic solvents have harmful effects on environment and human health. These alternative solvents are supercritical fluids and ionic liquids. Both of the solvents have some advantages such as adjustable solving power, being harmless for environment [1].

Chiral alcohols are widely used in food, fine chemical and pharmaceutical industries. The production of these compounds can be achieved with lipase-catalyzed kinetic resolution. Lipases have some useful properties such as wide substrate ranges, enantio- and regioselectivity, preserving activity and stability in non-aqueous media, not requiring cofactor etc. On the other hand, lipases usually show much higher enantioselectivity in resolutions compared to primary and tertiary alcohols [2].

In this study, synthesis of S-2-pentanol, a secondary alcohol and a chiral key intermediate for the synthesis of several potential anti-Alzheimer's drugs that inhibit amyloid peptide synthesis, was investigated in supercritical carbon dioxide ($scCO_2$) and organic solvents (hexane and heptane) under the atmospheric conditions. The effects of process parameters such as temperature, pressure, and acyl donor on S-2-pentanol production with a high enantiomeric purity by means of *Candida antarctica* lipase B catalysed kinetic resolution was examined.

Consequently, enzymes used in the stirring-batch supercritical carbon dioxide reaction media (40 ^{o}C and 75 bar) exhibited increasing enzyme activity comparing with enzymes which that unused and used in the other systems. Enantiomerically excess and conversion values in the stirring-batch reactor systems (atmospheric and supercritical reactors) were 97-100% and >50%, respectively**.**

Key words: Supercritical CO_2, lipases, kinetic resolution, chiral alcohols.

References

[1]. Lozano, P., Diego, T. D., Carrie, D., Vaultier, M., Iborra, J. L., Journal of Molecular Catalysis A: Chemical (2004) 214, 113–119.

[2].Ghanem, A., Aboul-Enein, H. Y., Chirality (2005) 17, 1–15.

Our preference : poster presentation