

Enzymatic synthesis of lipophilic flavonoid derivatives in organic solvents containing ionic liquids

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1. Summary

Ionic liquids have no volatile organic compounds/ solvents discharged into the atmosphere and adjustable solubility properties. Some ILs could be the suitable media for flavonoids ester synthesis. Flavonoids like esculin have received keen attention due to their antioxidant, antimicrobial and anticarcinogenic properties. Flavonoids have some limitations in practical use by their low solubility and unavailability in hydrophobic media where lipid oxidation happens. The solubility of flavonoids can be increased by using ILs as media in the enzymatic synthesis reaction of flavonoids and fatty acids. The reaction rate and the reaction equilibrium may be affected during the flavonoids ester synthesis. This project used the concept of conventional solvent engineering to study the mixing system of IL and organic solvent system.

The aim of this study was to search for suitable organic solvents to mix with polar ionic liquids. These polar ionic liquids didn't have any enzyme activity in the lipophilic flavonoid reaction. The enzymatic model system consists of palmitic acid and esculin as substrates and uses commercial immobilized lipase (Novozym 435) from *Candida antarctica*. HPLC is used for the analysis.

Keywords: Esculin, Palmitic acid, ILs / organic solvent system, enzymatic synthesis

2. Extended Abstract

Compared with t-pentanol and t-butanol, acetone had the highest bioconversion 92% (72 h, 40°C) and initial enzyme activity (0, 046 mmol esculin /g enzyme /h). Seven different polar ionic liquids were used in acetone containing either 1%, 5% or 10% ILs for the enzymatic synthesis. The experiments showed that the acetone mixed with 1% Methyltrioctylammonium trifluoroacetate ([MTOA].TAF), 1% 1-Ethyl-3-methylimidazolium n-octylsulfate ([EMIM].OctSO₄) and 1% 1-Ethyl-3-methylimidazolium 2(2-methoxyethoxy) ethylsulfate ([EMIM].MDEG.SO₄) had lower initial enzyme activity than pure acetone media. Acetone with 1% [MTOA].TAF had the highest conversion (59%) in contrast to the other mixing systems with either 1% [EMIM].OctSO₄ (24%) or 1% [EMIM].MDEG.SO₄ (39%).

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The other 4 ILs mixed with acetone didn't have any enzyme activity. These results are being reported for the first time and are very useful to categorize ILs and to understand the influences of ILs' nature and structure on the enzyme activity. Among the 7 ILs we tested, we observed their influence on the enzyme activity: [MTOA].TAF> [EMIM].MDEG.SO4> [EMIM].OctSO4> [DMIM].DMP = [EMIM].ES = [EMIM].OTos = [HMIM].CL.

References

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