

Enhancement of the Catalytic Activity of Novozyme 435 with Carbohydrate based Ionic Liquids

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Introduction

Recently, the successful application of *Candida antarctica* lipase B immobilized on carbon nano tubes was presented.¹ The biocatalytic acrylic acid conversion offers an attractive option for the transition to a more environmentally friendly process while gaining more control over the selectivity of the reaction.

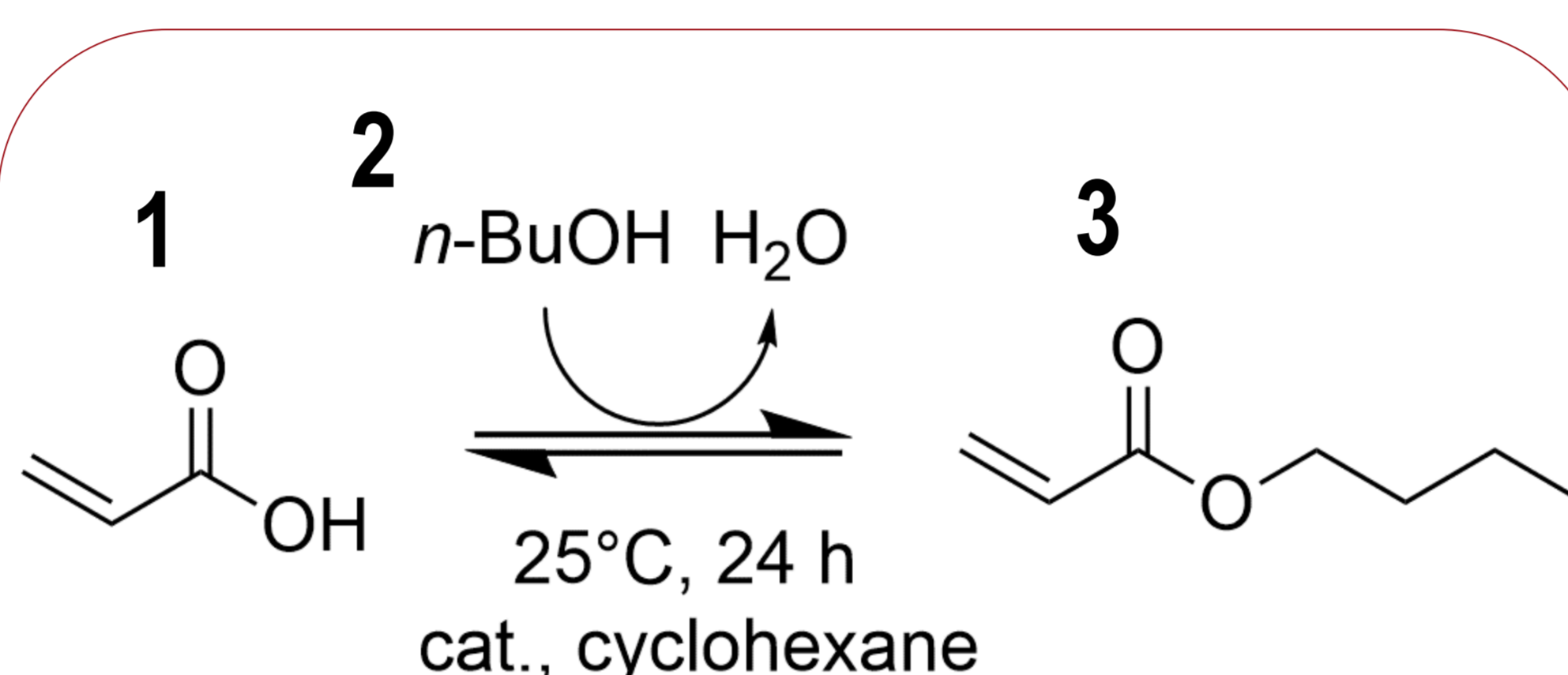


Fig. 1 Acrylation of *n*-butanol 2 to butyl-acrylate 3 (0.15 g cat., 1 mmol 1, 2 mmol 2)

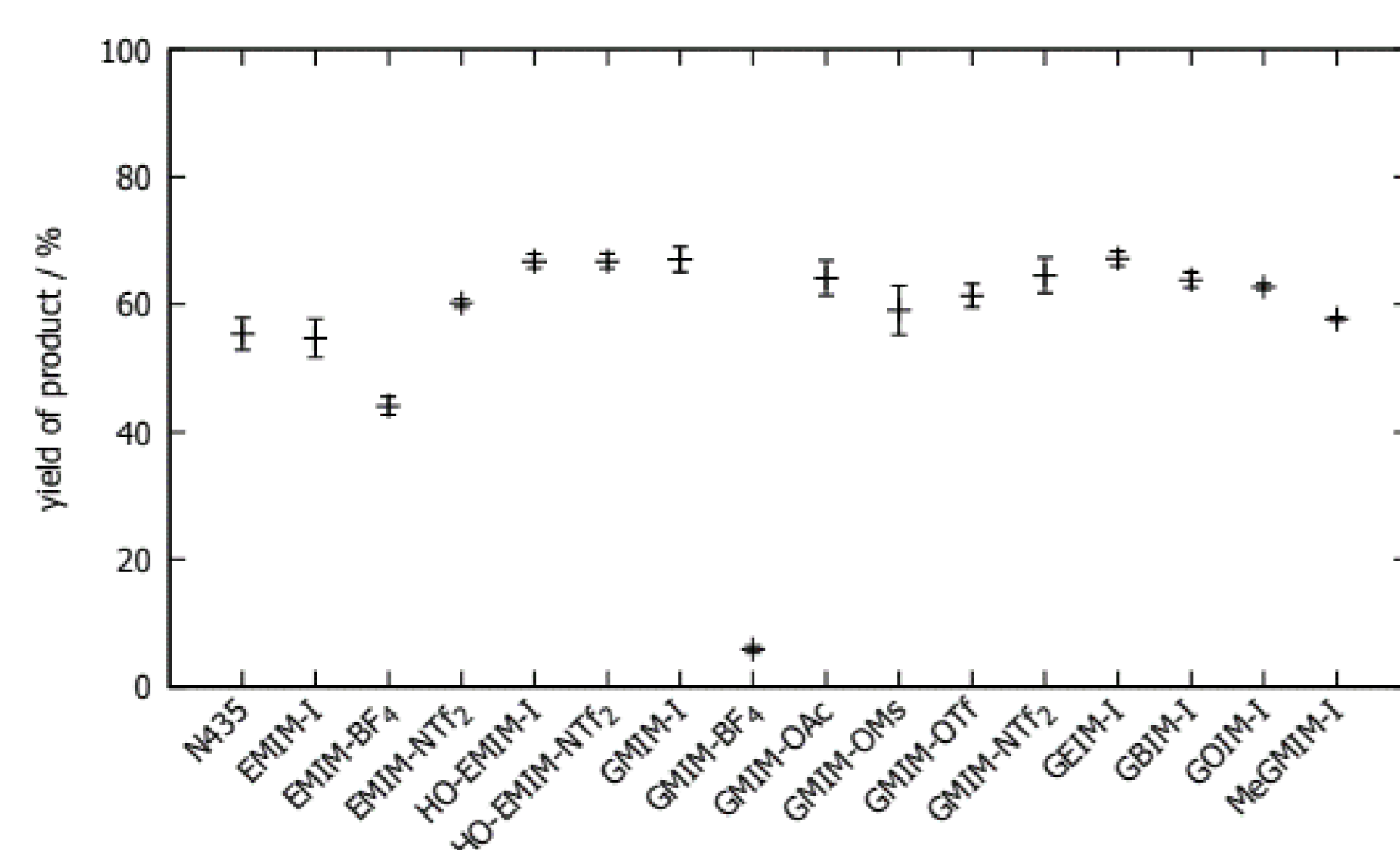
The implementation of the supported ionic liquid phase presents a possibility to enhance the catalytic activity of the enzyme. Herein, the role of the cation respectively anion is further elucidated. Therefore classical ILs as well as new glucosylimidazolium ILs (GMIM) are investigated.

Results

Experiments

68.6 μ L 1
183 μ L 2
748 μ L solvent
carried out in triplicate

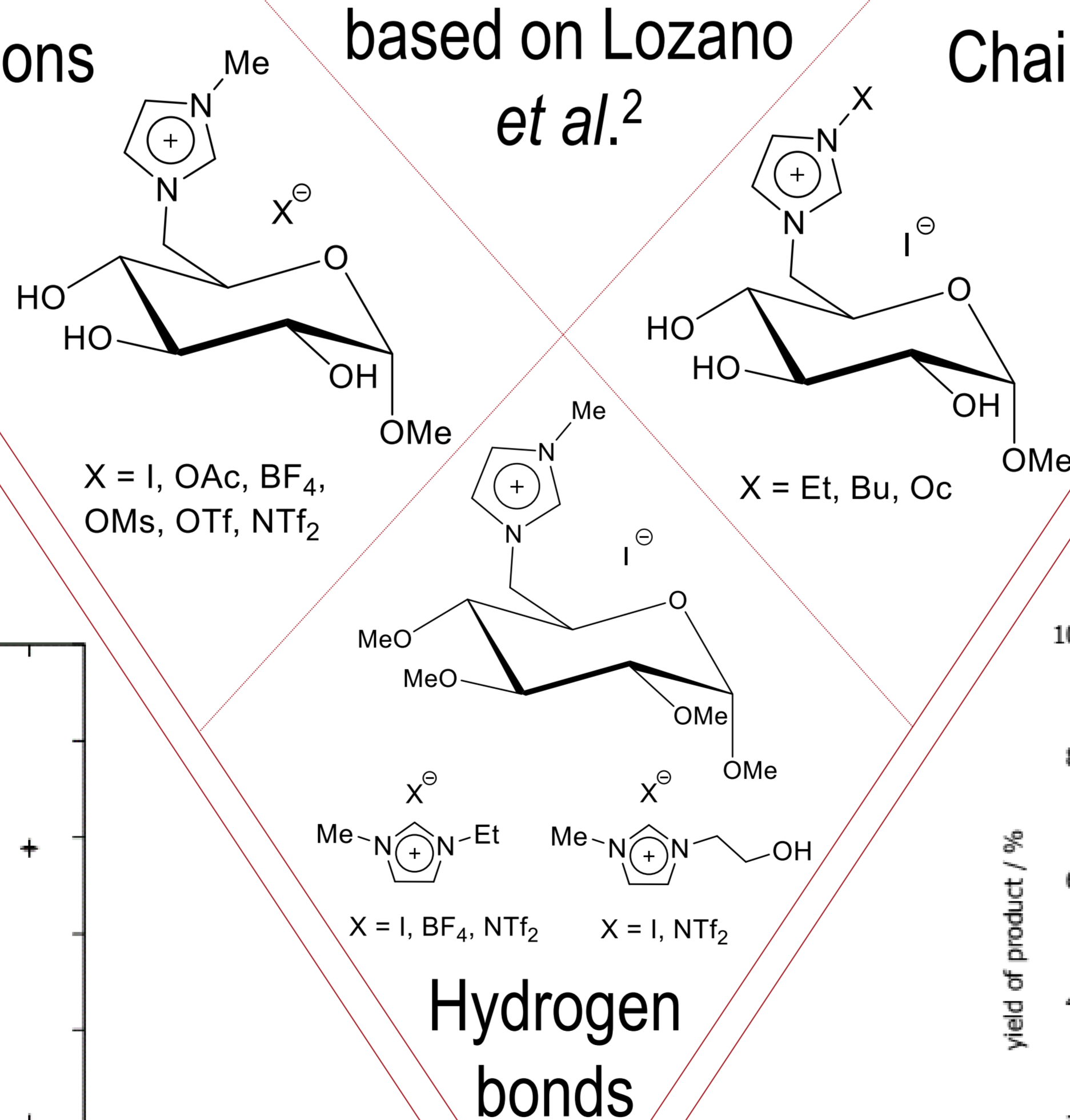
Fig. 2 yield of 3 for the coated catalysts, determined via GC-FID. Mean value with standard deviation is shown



Ionic Liquids

coating procedure based on Lozano *et al.*²

Anions



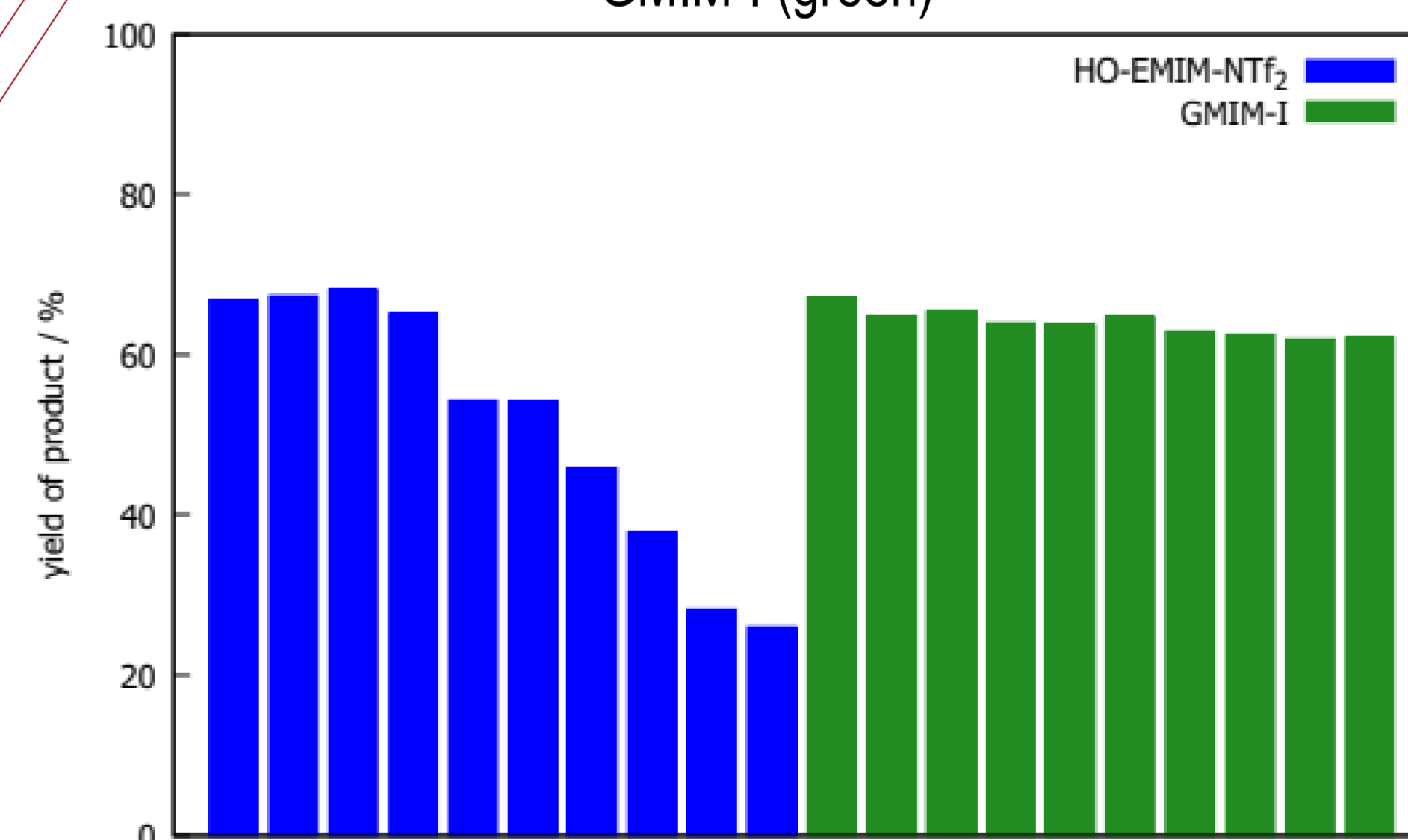
Chain length

Hydrogen bonds

Recycling

HO-EMIM-NTf₂ and GMIM-I ability to maintain catalytic activity was investigated

Fig. 3 yield of 3 for 10 consecutive cycles for HO-EMIM-NTf₂ (blue) and GMIM-I (green)



Conclusion

- ✓ Product 3 generated with max. yield of 67.1% for GMIM-I coated Novozyme 435
- ✓ Role of anion is neglectable but hydroxy functionality in the cation is key
- ✓ GMIM-I catalyst maintained operational stability for 10 cycles

- Paper in progress
- Further substrates in focus as a proof of concept

References

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