

6th European Young Engineers Conference

www.eyec.ichip.pw.edu.pl

Copyright © 2017, Faculty of Chemical and Process Engineering,
Warsaw University of Technology

Edited by:

Bartosz Nowak, MSc Eng.

Łukasz Werner, MSc Eng.

Patrycja Wierzba, MSc Eng.

ISBN 978-83-936575-4-4

Printed in 100 copies

The authors are responsible for the content of the papers.

All papers reviewed by Scientific Committee.

Published by:

Faculty of Chemical and Process Engineering

Warsaw University of Technology

Printed in Poland by:

Institute for Sustainable Technologies – National Research Institute

26-600 Radom, 6/10 Pułaskiego Street,

phone (+48) 48 36-442-41, fax (+48) 48 36-447-65

<http://www.itee.radom.pl>

Size enlargement and recovery of some cinchona-based organocatalysts applying organic solvent nanofiltration

*Péter Kisszékelyi¹, Petra Kozma¹, Bálint Zeller¹, György Székely², Péter Huszthy¹, József Kupai¹

¹ Faculty of Chemical Technology and Biotechnology, Budapest University of Technology and Economics, Budapest, Hungary

² School of Chemical Engineering & Analytical Science, The University of Manchester, Manchester, United Kingdom

e-mail: pkisszekelyi@mail.bme.hu

Keywords: *asymmetric synthesis, organocatalyst, organic solvent nanofiltration*

As a result of the increasing demand for optically pure products, asymmetric organocatalysis is of great interest for organic chemists, specifically in the pharmaceutical industry. However, the relatively high cost and low commercial availability of chiral organocatalysts, in addition to the high catalytic loading required in some cases (typically 1–30 mol%), pose a general challenge to the industrial development of economical and sustainable asymmetric organocatalytic processes.

The recycling of the organocatalyst may provide a suitable solution for this challenge. The application of organic solvent nanofiltration (OSN) was studied for some cinchona-based organocatalyst. OSN is capable of distinguishing molecules with size from 50 to 2500 Da, by only applying a pressure gradient. One possible way to enhance the catalyst rejection towards the membranes is to increase the molecular weight of the catalyst.

In this study, the so-called “hub approach” for the catalyst enlargement was used, where a trifunctional unit connects three catalyst molecules. Starting from 1,3,5-triethynylbenzene and 2-azidoethanol a click reaction was carried out resulting in the benzene *tris*(triazole)triethanol derivative. This skeleton was modified with three moles of cinchona squaramide catalysts.

As a second method, a β -cyclodextrin-based cinchona-thiourea catalyst was prepared in a reaction between a permethylated cyclodextrin isothiocyanate and the amino derivative of hydroquinine. These potential OSN organocatalysts can be applied in asymmetric *Michael* reactions (pentane-2,4-dione addition to β -nitrostyrene) and *Friedel–Crafts* reactions (indole addition to β -nitrostyrene).

Acknowledgements

Financial support of the Hungarian Scientific Research Fund/National Research, Development and Innovation Office (OTKA/NKFIH No. PD108462 and K 112289).