Slovak Society of Chemical Engineering
Institute of Chemical and Environmental Engineering
Slovak University of Technology in Bratislava

PROCEEDINGS

52nd International Conference of the Slovak Society of Chemical Engineering SSCHE 2026

Hotel SOREA TRIGAN
Štrbské Pleso, Slovakia
May 26 - 29, 2026

Editors: Assoc. prof. Mário Mihaľ

ISBN: 978-80-8208-177-3, EAN: 9788082081773

Published by the Faculty of Chemical and Food Technology, Slovak University of Technology in Bratislava in Slovak Chemistry Library for the Institute of Chemical and Environmental Engineering; Radlinského 9, 812 37 Bratislava, 2026

Lambarska, A., Hanefeld, U., Brasselet, H., van der Weel, L., Szymańska, K.: Highly Enantioselective Continuous Flow Henry Reactions Enabled by Immobilised Hydroxynitrile Lyases, Editors: Mihaľ, M., In *52nd International Conference of the Slovak Society of Chemical Engineering SSCHE 2026*, Štrbské Pleso, Slovakia, 2026.

Highly Enantioselective Continuous Flow Henry Reactions Enabled by Immobilised Hydroxynitrile Lyases

Aleksandra Lambarska[1,2], Ulf Hanefeld[2], Hugo Brasselet[2], Laura van der Weel[2], Katarzyna Szymańska[1]

[1]*Department of Chemical Engineering and Process Design, Faculty of Chemistry, Silesian University of Technology, 44-100 Gliwice, Poland*
[2]*Biocatalysis, Department of Biotechnology, Delft University of Technology, 2629 HZ Delft, the Netherlands*

e-mail: aleksandra.lambarska@polsl.pl

Keywords: flow chemistry, Henry reaction, heterogeneous biocatalysts, hydroxynitrile lyases, monolithic structural microreactors

Exploiting the catalytic promiscuity of hydroxynitrile lyases (HNL), we applied these enzymes in asymmetric Henry reactions under continuous flow conditions. Biocatalytic C–C bond formation remains challenging due to limited enzyme stability and incompatibility with non-conventional reaction media. Here, we present an efficient strategy combining enzyme immobilisation with continuous flow processing to enable highly enantioselective Henry reactions.

The enzymes were immobilised on organically modified silica monolithic microreactors and applied in a biphasic system under continuous flow conditions. This setup enabled efficient synthesis of chiral β-nitroalcohols, important building blocks in the synthesis of biologically active compounds, from aromatic aldehydes and nitroalkanes.

The system delivered (*R*)-1-phenyl-2-nitroethanol with excellent enantioselectivity (>99% ee) and demonstrated stable performance during extended operation. The monolithic reactor architecture ensured efficient mass transfer and robust catalyst integration, while spectroscopic analysis confirmed stable enzyme immobilisation, highlighting the advantages of covalent attachment.

Overall, this work establishes a robust and scalable platform for asymmetric Henry reactions, thereby expanding the applicability of HNL in continuous-flow biocatalysis.

Acknowledgement: This conference participation was co-financed by the project no. FESL.10.25-IZ.01-07E7/23. The corresponding author gratefully acknowledges the general financial support from the Ministry of Science and Higher Education (Poland) program under grant PERŁY NAUKI agreement PN/01/0267/2022.