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

PROCEEDINGS

51st International Conference of the Slovak Society of Chemical Engineering SSCHE 2025

Hotel DRUŽBA
Jasná, Demänovská Dolina, Slovakia
May 27 - 30, 2025

Editors: Assoc. Prof. Mário Mihaľ

ISBN: 978-80-8208-158-2, EAN: 9788082081582

Published by the Faculty of Chemical and Food Technology Slovak Technical University in Bratislava in Slovak Chemistry Library for the Institute of Chemical and Environmental Engineering; Radlinského 9, 812 37 Bratislava, 2024

Vobecká, L., Slouka, Z., Přibyl, M.: Enzymatic synthesis of L-phenylserine in a semi-continuous milifluidic system, Editors: Mihaľ, M., In *51st International Conference of the Slovak Society of Chemical Engineering SSCHE 2025*, Jasná, Demänovská Dolina, Slovakia, 2025.

Enzymatic synthesis of L-phenylserine in a semi-continuous milifluidic system

Lucie Vobecká[1], Zdeněk Slouka[1,2], Michal Přibyl[1]

[1] *University of Chemistry and Technology Prague, Department of Chemical Engineering, Technická 3, Prague 6, 16628, Czech Republic*
[2] *University of West Bohemia, New Technologies - Research Centre, Univerzitní 8, Plzeň 30614, Czech Republic*

e-mail: lucie.vobecka@vscht.cz

Keywords: mili-reactor, enzymatic reaction, membrane reactors, L-phenylserine

Enzyme production is expensive, so we strive to make the best use of the enzyme during enzymatic reactions and preserve its lifetime. However, the enzyme is subject to rapid degradation, especially when organic solvents are involved in the enzymatic reaction. Preventing such degradation relies on modifying either the enzyme itself or the reaction conditions, ensuring the enzyme retains its activity for as long as possible. We investigated a potential adjustment of the experimental conditions in synthesizing L-phenylserine from glycine and benzaldehyde. Benzaldehyde and an aqueous glycine solution form a two-phase system. Enzyme degradation is believed to occur at the interface of these two phases. We used a dialysis membrane to dose the organic phase to prevent direct contact between the phases. Such an arrangement was tested in a semi-continuous reaction mode, realized in a milli-fluid chip, shown schematically in Figure 1. The body of the chip consists of two chambers separated by a dialysis membrane. One closed chamber contained the enzyme, and the other served as a flow-through chamber for the aqueous phase reaction mixture. The reactants diffused through the membrane into the closed chamber, where they enzymatically reacted, forming the product. The product (specifically, L-phenylserine) passed back through the membrane into the aqueous solution stream and was collected for analysis after exiting the chip. The advantage of this arrangement is not only preserving enzyme activity for a longer time but also its reusability, significantly decreasing the cost of the enzyme associated with phenylserine production.

Figure 1: Schematics of semi-continuous mili-fluidic chip with dialysis membrane