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

Mihaľ, M., Stoláriková, Z., Červeňanský, I., Markoš, J.: Separation of succinic acid from the mixture of organic acids using pertraction, Editors: Mihaľ, M., In *52nd International Conference of the Slovak Society of Chemical Engineering SSCHE 2026*, Štrbské Pleso, Slovakia, 2026.

Separation of succinic acid from the mixture of organic acids using pertraction

Mário Mihaľ, Zuzana Stoláriková Ivan Červeňanský, Jozef Markoš

Institute of Chemical and Environmental Engineering, Faculty of Chemical and Food Technology, Slovak University of Technology, Radlinského 9, 812 37 Bratislava, Slovakia

e-mail: mario.mihal@stuba.sk

Key words: organic acid, pertraction, capillary membrane module, succinic acid, trioctylamine, mathematical model

Organic acids, weak chemical compounds defined by the presence of a carboxyl group, serve as vital components in numerous biochemical and industrial pathways. Among these, succinic acid (a dicarboxylic acid inherently present in plant and animal tissues) has emerged as a vital platform molecule. It finds extensive utilization in the synthesis of pharmaceuticals, cosmetics, food additives, and specialized chemical products. While traditionally synthesized via fossil-fuel pathways, contemporary focus has shifted toward sustainable microbial biosynthesis. Utilizing bacterial strains like *Actinobacillus succinogenes* and *Escherichia coli*, this green alternative leverages renewable feedstocks (including glycerol, agricultural waste streams, and lignocellulosic biomass) to mitigate environmental impacts and curb manufacturing costs. However, bio-based generation introduces downstream challenges, as succinic acid must be isolated from complex fermentation broths containing co-generated byproducts like formic, acetic, and lactic acids. Achieving high-purity yields necessitates advanced downstream processing. To optimize this purification matrix, the integration of multi-stage membrane technologies, specifically microfiltration, pertraction, and membrane crystallization, offers a highly efficient and sophisticated solution for target acid recovery.

In this work the set of equilibrium experiments at different pH with the aqueous solution of mixture of organic acids (succinic, acetic and formic acid) in the equilibrium system water-organic solvent (20 % mass trioctylamine in 1-octanol) were performed and compared with equilibrium experiments for individual organic acids. A strong competition of organic acids for extractant in its mixture was observed which notably decrease its individual partition coefficients in the mixture if compared with the aqueous solution of pure acids. Subsequently, the pertraction experiments (in capillary membrane module) with a model feed phase (aqueous solution of mixture of organic acids in different ratio) were realized at different conditions. The feed solution was kept by either at intrinsic pH with clear water used as stripping phase (both without pH regulation), or with feed phase regulated at pH 5 with strong alkaline stripping phase maintained at pH in range 12-13.5. For better understanding, pertraction experiments were simulated and measured data was predicted using mathematical model of the pertraction process.

Acknowledgement: This work was supported by the Slovak Scientific Agency, Grant No. VEGA 1/0658/24, and the Slovak Research and Development Agency under the contract No. APVV-22-0038 and VV-MVP-24-0365.