

## SELECTIVE EXTRACTION OF FORMIC AND ACETIC ACIDS FROM BIOSYNTHETIC MIXTURE WITH SUCCINIC ACID

Lenuta Kloetzer<sup>1</sup>, Alexandra Cristina Blaga<sup>1</sup>, Madalina Postaru<sup>2</sup>, Anca-Irina Galaction<sup>2</sup>, Dan Cascaval<sup>1</sup>

<sup>1</sup>“Gheorghe Asachi” Technical University of Iasi, Faculty of Chemical Engineering and Environmental Protection, Department of Biochemical Engineering, 73 D. Mangeron, 700050 Iasi, Romania,

<sup>2</sup>“Grigore T. Popa” University of Medicine and Pharmacy, Faculty of Medical Bioengineering, Department of Biomedical Science, 9-13 M. Kogalniceanu Street, 700454 Iasi, Romania,

This work investigates the possibility of selective separation of succinic, formic, and acetic acids from biosynthetic mixture obtained by fermentation with *Actinobacillus succinogenes* using reactive extraction with tri-n-octylamine (TOA) dissolved in different solvents (dichloromethane, n-butyl acetate and n-heptane). The extraction process was analyzed by means of the extraction degree and the selectivity factor, defined as the ratio between the cumulated extraction degrees of formic and acetic acids and that of succinic acid. It was concluded that the efficiency of the reactive extraction system is influenced by solute acidity, extractant concentration, and solvent polarity.

For underlining the effect of solute acidity in the sequence of acid extraction from biosynthetic mixture, the influence of TOA concentration on extraction efficiency was analyzed for each considered solvent. Because succinic acid possesses two stages of ionization, these studies were carried out for two values of pH of the aqueous phase, pH = 1 and pH = 5, respectively. In all cases, the increase of extractant concentration in the organic phase induced a positive effect on extraction yields of the studied acids. The experimental data indicated that for certain concentration values of TOA in the organic phase, formic and acetic acids could be selectively extracted, while succinic acid remains in the raffinate phase.

The separation selectivity is controlled by extractant concentration in the organic phase. Thus, the maximum selectivity factor ( $S = 92$ ) has been reached for reactive extraction with dichloromethane containing 30 g/l TOA, at pH = 1. In these conditions, the acids extraction yields were 83% for formic acid, 18% acetic acid, and 1.1% for succinic acid. The total removal of formic and acetic acids from the original mixture can be made through a multi-stage extraction, adjusting the extraction concentration in each stage to not exceed the amount required for the stoichiometric reaction only with these two acids.

**Keywords:** reactive extraction, selectivity factor, succinic acid, *A. succinogenes*, tri-n-octylamine