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**Title:**

**Ultrathin membranes with tunable permeation characteristics for primary recovery of itaconic acid produced by fermentation**

**Authors & affiliations:**

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**Abstract:** (Your abstract must use **Normal style** and must fit in this box. Your abstract should be no longer than 300 words. The box will 'expand' over 2 pages as you add text/diagrams into it.)

**Preparation of Your Abstract**

1. The title should be as brief as possible but long enough to indicate clearly the nature of the study. Capitalise the first letter of the first word ONLY (place names excluded). No full stop at the end.

2. Abstracts should state briefly and clearly the purpose, methods, results and conclusions of the work.

Introduction: Clearly state the purpose of the abstract

Methods: Describe your selection of observations or experimental subjects clearly

Results: Present your results in a logical sequence in text, tables and illustrations

Discussion: Emphasize new and important aspects of the study and conclusions that are drawn from them

Ultrathin membranes have the potential to address energetic and environmental challenges faced by separation techniques commonly used for the primary recovery of organic acids.

In this work, ultrathin membranes were fabricated via spin coating of a mixture of two precursors - branched polyethylenimine and poly[(o-cresyl glycidyl ether)-co-formaldehyde] - and the composition of the casting solution was adjusted to improve the separation performance. By increasing the content of polyethylenimine in the casting solution, the transport rate of itaconic acid in pure solutions was increased by a factor of 40. Membranes with a mass ratio between polyethylenimine and poly[(o-cresyl glycidyl ether)-co-formaldehyde] reactive groups of 4:1 were selected, and their ability to recover itaconic acid from a variety of solutions – from pure solutions to recombinant *Pichia Pastoris* culture supernatant – was demonstrated. Experiments with pure solutions of culture supernatant components demonstrated that the membranes were at least 7 times more selectivity for itaconic acid than for culture medium components. Experiments with synthetic complex solutions confirmed the membrane ability to recover itaconic acid, along with the cultivation by-products, from complex solutions. Lastly, the recovery of itaconic acid from recombinant *Pichia Pastoris* culture supernatant was demonstrated. The separation performance was similar for supernatant and pure itaconic acid solutions, despite the significant difference in complexity of these solutions, highlighting the robustness of the membrane performance.

To complement this study, the structural properties of the ultrathin membranes were thoroughly investigated and linked to their separation performance. A host of properties known to impact the membrane performance - such as intrinsic porosity, thickness, surface morphology, chemistry, charge, and wettability - was analyzed.