

## Multistage ultrafiltration treatment of brine from fish processing in the aspect of regeneration and reuse in the production cycle

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### ABSTRACT

In this paper, the results of the multistage research based on ultrafiltration using ceramic membranes with an active layer of  $\text{TiO}_2/\text{ZrO}_2$  and 300 – 8.0 kDa cut-off are presented. This work seeks to advance the state of the art in the membrane technology for a protein separation and treatment of waste brine from fish processing. In the first stage, analyses and evaluation of a ceramic membrane performance in model protein-water-NaCl systems were performed and molecular simulation studies on a model protein size and stability in certain pH ranges were carried out. In the second stage, tests on the treatment of industrial waste brines using commercial membrane modules with a filtration area of 0.35 m<sup>2</sup> were conducted. The filtration tests were carried out using a pilot plant with a tubular module under variable process conditions. The ultrafiltration treatment of waste brines was investigated using single and multistage technology schemes. The obtained results were elaborated in the form of a database for a decision support system. In the third stage, the decision support system was developed using MATLAB based on the database of results. The elaborated decision support system enables the selection of an optimal scheme of technology for the treatment of waste brines from fish processing and protein concentration for its further use.

*Keywords:* Ceramic membranes; Ultrafiltration; Waste brine; Decision support system

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