

## Ultrafiltration of oil-in-water emulsion: Comparison of ceramic and polymeric membranes

Gyula N. Vatai<sup>a\*</sup>, Darko M. Krstić<sup>b</sup>, András K. Koris<sup>a</sup>, Igor L. Gáspár<sup>a</sup>, Miodrag N. Tekić<sup>c</sup>

<sup>a</sup>Department of Food Engineering, Corvinus University of Budapest, Ménesi st. 44, H-1118 Budapest, Hungary  
Tel. +36 (1) 482-6232; Fax. +36 (1) 482-6323; email: gyula.vatai@uni-corvinus.hu

<sup>b</sup>Novel Technologies (Malta) Ltd., Zinja No. 2, Triq il-Kappara, MSK 3300 Marsascala, Malta  
email: info@novelmalta.com

<sup>c</sup>Faculty of Technology, University of Novi Sad, Bulevar Cara Lazara 1, 21000 Novi Sad, Serbia  
email: mntekic@uns.ns.ac.yu

Received 1 October 2008; Accepted 12 February 2009

---

### ABSTRACT

Ultrafiltration (UF) has been recognized as a highly attractive technique for the treatment of stable oil-in-water emulsions. This technique has proved to be more effective than conventional methods since it may produce a water phase of higher quality and an oil phase which can be recycled. However, low permeate fluxes due to membrane fouling still represent one of the main limitations for its extensive application. The aim of this paper is to further contribute to the investigations of mass transfer characteristics during UF of oil-in-water emulsions. The performance of a polymeric (polyaryletherketone) membrane and a ceramic (zirconia) membrane were compared under different parameters of the UF process. The permeate recirculation experiment showed that the ceramic membrane is sensitive to oil penetration at lower cross-flow velocities and higher transmembrane pressures. The optimal performance for the ceramic membrane was obtained at a lower feed flow rate and transmembrane pressure compared to the optimal values for the polymeric membrane. The comparison experiments with volumetric concentration of the feed were carried out at optimal operation conditions for each of the membranes in order to maximise their performance. While the polymeric membrane showed expected oil rejection variation consistent with surface layer formation, the ceramic membrane showed poor oil rejection at the beginning of the operation. Further investigations need to show if the poor initial oil rejection of the ceramic membrane can be reduced without losing proved advantages of ceramic membranes over polymeric membranes.

*Keywords:* Cross-flow ultrafiltration; Oil-in-water emulsion; Polyaryletherketone; Zirconia

---

---

\* Corresponding author.