

# Extraction and transport of small organic compounds using polymer inclusion membranes (PIMs)

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**1. Introduction** - The use of polymer inclusion membranes (PIMs) for environmental decontamination of toxic organic molecules from waste waters is a very promising technique for a variety of reasons among which are the low cost and high stability of membranes. In this present study, we report the preparation of membranes containing only the PVA (polymer poly (vinyl alcohol)) as support, and the insoluble  $\gamma$ -cyclodextrin polymer (poly  $\gamma$ -CD) as carrier. The membranes obtained was characterized by several techniques, namely Scanning Electron Microscopy (SEM), Fourier Transformed Infrared Spectroscopy (FT-IR), and X-ray diffraction (DRX). The combined effects of various experimental parameters on the phenol (molecule mode) transport flux through these membranes are investigated using a  $2^3$  full factorial design at two level [1][2].

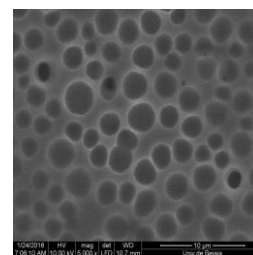


Figure I. Polymer inclusion membrane (PIM)

**2. Experimental** – The phenol transport flux from aqueous solutions was studied in a pertraction system under various experimental conditions, such as Poly  $\gamma$ -CD membrane content, stirring rate and initial phenol concentration. According to the design chosen, eight experiments of the factorial design and three central points for statistical validity were performed.

**3. Results-** The obtained regression equation shows that the initial phenol concentration of the solution ( $x_3$ ) has the strongest and positive effect on the transport flux, since the corresponding coefficient is positive and the most important of the others investigated factors. The stirring rate also affects positively the phenol transport flux through the PIM since his effect is positive on the response.

**3. Conclusion** - The SEM revealed that the carrier is dispersed homogenously in the polymer matrix Figure I. An empirical correlation between phenol transport flux and independent variables (Poly  $\gamma$ -CD membrane content, stirring rate and initial phenol concentration) was successfully obtained. Statistical analysis showed that initial phenol concentration of the solution was the most influent parameter in the study domain. The observation of surface contour plots allows choosing the favorable and economical conditions driving to a satisfactory phenol transport flux across PIMs and therefore condition for optimal phenol extraction in aqueous media like wastewaters.

## 4. References

- [1] G. Sado et M. C. Sado, Les plans d'expériences de l'expérimentation à l'assurance qualité. Edition Afnor Technique, (1991).
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