EFFECT OF MOLECULAR WEIGTH CUTT-OFF, MATERIAL MEMBRANE, pH AND IONIC STRENGTH OVER THE REMOVAL OF NATURAL ORGANIC MATTER

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INTRODUCTION

Natural organic matter in aquatic environments can forms carcinogenic organochlorine compounds when is chlorinated [1]. On the other hand, the lack of water in the southeast of Spain is the main reason for studying new forms of purification techniques optimisation. This optimisation will improve the use of natural waters.

The objective of this work is to study the removal of humic acids with a ultrafiltration system using polyethersulfone (5, 30 kDa MWCO) and cellulose regenerated (10, 30kDa) membranes, and study effects of conductivity and pH.

MATERIALS:

♦**EQUIPMENT**: Ultrafiltration experiments were carried out in a stirred cell apparatus (Model 8200 Amicon Millipore).

♦ **MEMBRANES**: Ultrafiltration disc membranes obtained from Amicon were used. Membranes had a diameter of 63.5mm.

MEMBRANE	MATERIAL	MWCO
PES	polyethersulfone	5000 - 30000
RC	regenerate cellulose	10000 - 30000

♦ **FEED WATER**: Commercial humic acid (sodium salt, Aldrich). (10 mg/L).
Conductivity: 1000-6000 µS adjusted by adition of kCl (0.1 M).
pH: 2.5-9 adjusted by addition of phosphate or H3PO4 buffer.

♦**ANALYTICAL METHODS** ::
Dissolved Organic Carbon (DOC): Shimadzu TOC-5000 analyser.
UV absorbance: UV/VIS spectrophotometers at the 254 nm.

METHODS:

♦ **FILTRATION PROTOCOL**:

1º) Stirred cell was initially filled with DI water adjusting pH and conductivity. Water flux was measured as a function of time at a constant pressure (100kPa), until steady flux was achieve.

2º) Stirred cell was emptied with a humic acid solution and the system was repressurized. The filtrate flow rate was measured. Permeate samples were collected periodically for concentration analysis.

3º) Stirred cell was emptied and refilled with DI water at the same pH and conductivity as initial experiment and water flux was measured.

Note:

P= 100kPa; Tª= 20 ºC; stirring speed 200rpm.

RESULTS AND DISCUSSION:

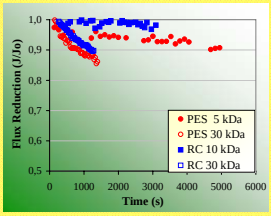
♦ EFFECT OF MEMBRANE AND MWCO

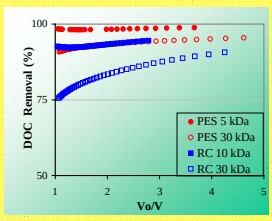
The DOC removal decrease and the flux declines further, with the increase of MWCO.

The efficiency of the removal of organic compounds are higher in PES membranes than in RC membranes.

This efficiency is between 99-90% in PES and between 85-75% in RC.

The hydrophobicity of PES membrane is the main cause of this differences.





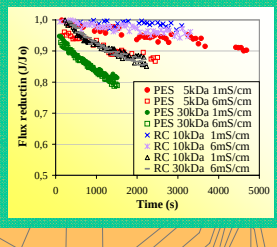
♦ EFFECT OF CONDUTIVITY

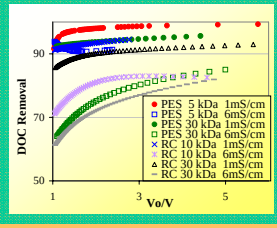
The DOC removal decrease with the increase of conductivity for all membranes and MWCO.

The flux declines further as the conductance increase form membrane PES 5kDa and 30kDa.

There is no an important variation of the flux with the change of conductivity for membranes of RC.

Increased ionic strength shields some of the repulsive charges between the adsorbing molecules, resulting ain increased adsorption.



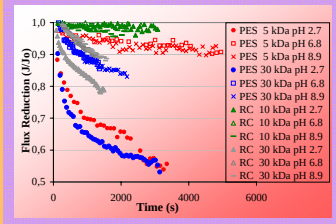


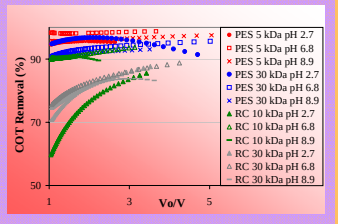
♦ EFFECT OF pH

The humic acid solution at pH 2.7 show the worst flux decline for membranes PES 5-30kDa and RC 30 kDa.

There is no flux variation for RC membrane of 10 kDa with the variation of pH.

The charge on the humic acid becomes less negative as the pH is decreased, causing the electrostatic repulsion between humic acid molecules to decrease, and fouling increase.





♦ CONCLUSION

This study show, that the best remove of NOM occurs using PES membranes, although the fouling is bigger in PES membranes than in RC membranes.

High ionic strength produce a decrease of DOC removal in PES and RC membranes, and an increasing of fouling membrane in PES membranes.

Low pH cause an important increase of the fouling membrane.

♦ REFERENCES

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♦ ACKNOWLEDGEMENT

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