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# Surface modification of poly(ethylene-co-vinyl alcohol) membranes by molecular imprinting technique for biomedical application

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**INTRODUCTION:** Molecular Imprinting Technology allows to prepare polymeric materials with selectivity towards specific molecules through polymerization or phase inversion in presence of template [1]. This work is focused on searching innovative biomedical uses of these materials as extracorporeal purification systems or recognition-able implantable devices. An other interesting application of this research is the preparation of materials exhibiting molecular recognition behaviour towards biological compounds, able to promote cell adhesion, for application in tissue engineering [2-3]. Recent efforts of research in biomedical field are focused towards the imprinting of compounds such as peptides, aminoacids, phospholipids and proteins. This work regards the imprinting of phosphatidylcholine (PC) in a membrane of ethylen-vinyl alcohol (EVAl).

**METHODS:** The membranes were prepared by the phase inversion technique. A solution of EVAl in dimethyl sulfoxide (DMSO) was added with a solution of PC in tetrahydrofuran (THF) (PC/total membrane weight =0,11). The resulting solution was spread uniformly on a glass plate using a knife machine and then immersed in a first inversion bath (50/50 DMSO/water) at room temperature. After 1 hr the formed membrane was transferred in a second bath (water) for 15 hr. Finally, the membranes were dried in a ventilated oven at 30°C. The morphological, chemical and physical characterization was carried out by Scanning Electron Microscopy (SEM), Thermo Gravimetric Analysis (TGA) and Differential Scanning Calorimetry (DSC). Total reflection Fourier transform infrared (FT-IR) spectra were carried out by means of a Perkin Elmer Spectrum One FT-IR Spectrometer, equipped with a Perkin Elmer Universal ATR Sampling Accessory and a Perkin Elmer Spectrum Spotlight FT-IR Imaging System.

The template (PC) was removed from the membrane using a permeability apparatus in which the solvent (isopropyl alcohol) passes through the membrane, placed into the permeability cell, under a pressure gradient. Biomimetic behaviour of the membranes for the recognition of PC and cellular adhesion tests were performed.

**RESULTS:** SEM micrographs of the EVAL-PC membrane showed a uniform porosity with size of 1÷2 μm. DSC data evidenced an increase on EVAl cristallinity due to the presence of PC in the membrane. The analysis by spectrophotometer UV-visible of isopropyl alcohol permeated through the membrane for 5 hr showed that the 80% of PC was removed. These data were confirmed from TGA which shown the same events of weight loss in the membrane where PC has been removed compared to an EVAl not imprinted membrane.

The spectrum spotlight FT-IR images, as well as the correlation map of the spectrum, showed the presence of PC uniformly dispersed on the surface before the template removal (dark area in fig.1) and the reduction of PC amount, with a consequent lower correlation, after release in isopropyl alcohol.

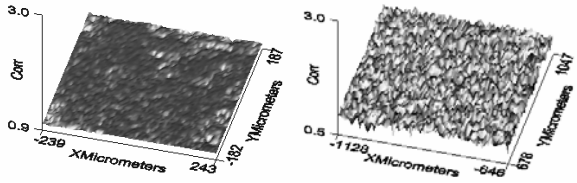


*Fig. 1: FT-IR map of an imprinted membrane before (left) and after (right) PC release.*

Preliminary tests about the cellular adhesion seem to be promising: cellular adhesion was good for the membrane which had released the template, while any cell was present on not imprinted EVAl membrane and on imprinted sample before PC extraction.

**DISCUSSION & CONCLUSIONS:** Molecular imprinting of the EVAl membrane with PC has shown an interesting modification of matrix surface. This result suggests the applications of this membrane in tissue engineering and also for the selective recognition of biological compounds.

**REFERENCES:** [1]L. Ye, P.A.G. Cormack and K. Mosbach (2001) *Anal. Chim. Acta* **435**(1): 187-196. [2]M. Ulbrict (2004) *Journal of Chromatography B* **804**: 113-125. [3]M. Ramamoorthy, M. Ulbricht (2003) *Journal of Membrane Science* **217**: 207-214.