Artificial enantiopure inherently chiral membranes: enantiodiscrimination trough a new "ion-selective like" setup

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Abstract. High-efficiency resolution technology is fundamental for scaling-up separation of enantiomerically pure substances. Membrane technology fulfils this requisite, in fact it is characterized by *i)* high efficiency, *ii)* simplicity and *iii)* convenience for up- and/or down-scaling. Membrane-based chiral resolution can be achieved using either enantioselective or non-enantioselective membranes. Enantioselective membranes can be used for chiral separation of enantiomers because they contain chiral recognition sites. In this frame we have discovered that the electrooligomerization, in acetonitrile as solvent, for 108 deposition cycles, on an ITO electrode support, of our "inherently chiral" benchmark monomer, leads to self-standing racemic or enantiopure membranes. These ones were obtained by simply peeling off the solid deposit from the ITO immersed in water after the electrodeposition in acetonitrile. We have then characterized inherently chiral membranes by a multivariate technique approach (*e.g.* electrochemical impedance spectroscopy, scanning electron microscopy, BET for surface area and pore size distribution, and atomic force microscopy) comparing the racemic *vs* enantiopure deposit properties. Considering *i)* the outstanding enantioselection ability achieved with our both inherently chiral electrode surfaces and media [1-2] and *ii)* the perfectly specular CD spectra displayed by the two membrane enantiomers, we have decided to implement enantiopure inherently chiral membranes in a "ion-selective like" set-up in order to study their enantiorecognition capability (as depicted in Figure on the right). First of all we have verified the potential difference was read correctly through the membrane to allow correct determinations of transmembrane potentials. After that we have tested enantiopure membranes in the presence of chiral charged species (in all configurations for both membranes and internal/external electrode solutions) for determining their enantioselective capability. Preliminary results are very promising and encourage us to perform the scaling up of the membrane electrosynthesis to be used for industrial scopes and to extend the study to other probe useful in the analytical and pharmaceutical field.

References:

[1] S. Arnaboldi, M. Magni, P. R. Mussini, *Curr. Op. in Electrochemistry* 8 (2018) 60-72.

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