SCIENCESPRINGDAY

FACULDADE DE CIÊNCIAS E TECNOLOGIA
UNIVERSIDADE NOVA DE LISBOA

Chemistry Departament

Design of functional membranes

Biochemical and Processes Engineering Group

bpeg biochemical and process engineering group

requimte rede de química e tecnologia

Carla Portugal

Assistant researcher -since 2009

- **2005,** PhD in Chem. Eng. - Membrane Processes
- **1999,** Graduation in Chem. Eng.

- Published papers: 15
- Book chapters: 2
- Oral and panel communications: over 50

FCT Fundação para a Ciência e a Tecnologia
MINISTÉRIO DA EDUCAÇÃO E CIÊNCIA

Objectives

- The main goal of my work is to explore the properties of stimuli sensitive compounds which are capable to respond to specific stimuli by switching reversibly their physico-chemical properties in the design of membranes with innovative functionalities.
- Stimuli-responsive membranes will be able to respond to these stimuli by dynamic and controlled switching of their structural and chemical properties. It is aimed that these chemical and structural changes may allow the improvement of membrane permeability and selectivity and thus the enhancement of membrane separation efficiency.
- Microscopic and spectroscopic techniques are used to determine membrane structural and chemical characteristics and to get a in-depth knowledge on the molecular events that drive the membrane performance and solute transport characteristics.

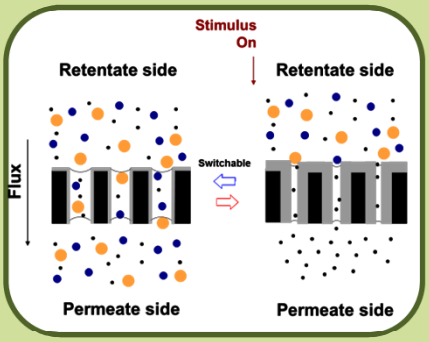
Methodology

- Non-mass related stimuli-responsive membranes, e.g. photo and magnetic responsive membranes are prepared using UV-grafting polymerization, layer-by-layer methodologies and/or by immobilization of magnetic ionic liquids within porous membrane matrices – supported magnetic ionic liquid membranes (SMILMs).
- Optimal membrane designs are obtained based on the correlation between membrane preparation procedures and performance efficiency is provided by:
  1) electron Paramagnetic resonance (EPR), ATR-FTIR, XPS, impedance spectroscopy
  2) impact of the magnetic field on SMILMs structural stability and transport properties are accessed through viscosimetry, ICP and H-NMR relaxometry.
- Fluorescence spectroscopy is used to get a better comprehension of solute transport properties and interactions at the membrane surface.

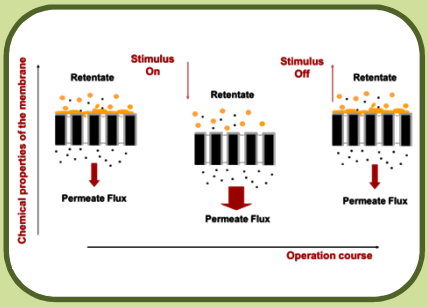
Expected Results

- Development of membranes able to adapt reversibly to the specific needs of different membrane based processes.
- Preparation of membranes with optimal designs sustained by a deep comprehension of the molecular mechanisms underlying membrane responsive behaviour
- Adequate membrane responsive behaviours are expected to allow the improvement of process efficiency in different membrane technology application fields, in particular biomedical, pharmaceutical and biotechnological applications where product purity and quality is a crucial requirement.

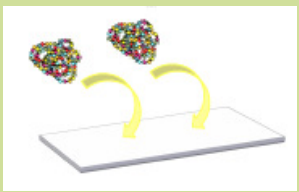
Membrane selectivity

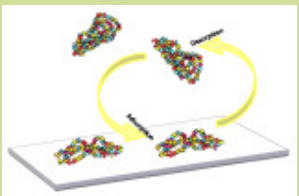


Permeate fluxes



Protein-surface interactions





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