

Polyelectrolyte functionalized membranes for organic solvent nanofiltration (OSN)

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Organic Solvent Nanofiltration (OSN) is a relatively new technology that allows size-exclusion based separation of solutes between 50 and 2000 g mol⁻¹, solvent exchange or solvent recovery, all in organic media simply by applying a pressure gradient. Its fields of applications range from pharmacy, catalyst regeneration, to oil and solvent treatments.

Polyelectrolytes are a class of macromolecules with functional groups that either are permanently charged or can be charged under specific pH conditions. Polyelectrolyte multilayer (PEM) thin films could be a good candidate for OSN applications, since thin selective layers have proven to be highly permeable and to some extent selective for charged molecules, while they have excellent stability in common organic solvents.

In this project a thin film of polyelectrolyte selective layer will be formed on top of the porous support via the layer-by-layer (LbL) method. The modified membrane will be characterized with SEM-EDX, AFM, XPS and water contact angle. Also, permeation/separation properties of the modified membranes will be investigated.

For further information please click on the link below:

<http://www.sciencedirect.com/science/article/pii/S1385894715017337>

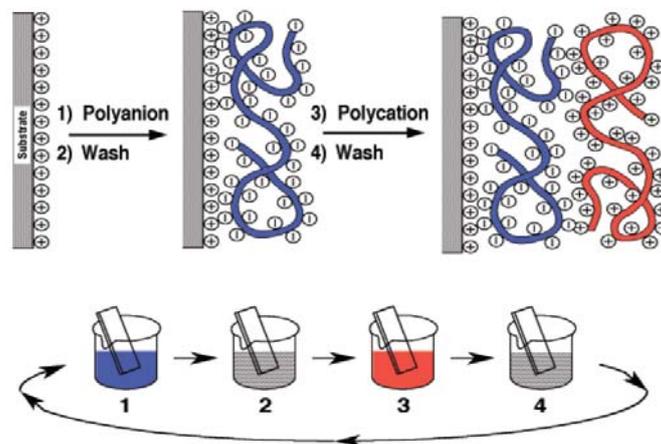


Figure 1. Schematic diagram showing the formation of thin organic films using layer-by-layer adsorption of polyelectrolytes.

Methods:

- LbL deposition of polyelectrolytes;
- Characterization of surface chemistry and morphology;

Student tasks:

- Literature background;
- Modification of nanofiltration membranes with a series of polyelectrolytes and test the performance (permeation/separation) for OSN application.
- Membrane characterization;
- Data treatment and report preparation.

Potential application:

- Chemical and petrochemical industries
- Solvent recovery

Literature:

- (1) Amirilargani, M.; Sadrzadeh, M.; Sudholter, E.J.R.; de Smet, L.C.P.M. Surface modification methods of organic solvent nanofiltration membranes. *Chemical Engineering Journal* 2016 (286) 562-582.
- (2) M.L. Bruening, D.M. Dotzauer, P. Jain, L. Ouyang, G.L. Baker, Creation of Functional Membranes Using Polyelectrolyte Multilayers and Polymer Brushes, *Langmuir*, 24 (2008) 7663-7673.
- (3) Tang, Z., Wang, Y., Podsiadlo, P., Kotov, N.A. Biomedical applications of layer-by-layer assembly: From biomimetics to tissue engineering, *Advanced Materials*, 18 (2006) 3203-3224.