



**The 11th International
Symposium on Drug Analysis
&
The 29th International
Symposium on Pharmaceutical
and Biomedical Analysis**

Symposium Program Book



**September 9 – 12, 2018
Leuven, Belgium**

Modification of polysulfone membranes with molecular imprinted polymers for selective separation of toxic uremic compounds

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During the hemodialysis process, porous polysulfone (PSf) membrane is used to remove uremic toxins of different size and physicochemical properties. However, the removal of lipophilic molecules is markedly lower than of hydrophilic molecules, since they bind to blood proteins. The insufficient removal of uremic toxins has negative effect on many body systems, as well as on overall patients' outcomes^[1].

Molecular imprinted polymers (MIPs) are well known chemical structures which have specific sites for the selective binding of biomolecules, that is why MIPs have been widely exploited in chromatographic and extraction techniques^[2]. Therefore, porous membranes with incorporated recognizing binding sites would be of great interest for hemodialysis, since they would help to diminish the negative effects caused by the uremic toxins, which accumulate in the blood of patients with renal failure.

The aim of this work was to prepare flat sheet PSf membranes with MIP designed for uremic toxin, incorporated into its structure. Similar non-imprinted polymer (NIP) was added and the effect of MIP or NIP was investigated in the selective extraction of uremic toxins, on membrane separation characteristics and porosity.

The MIP obtained as a powder, with maximal particles size 0.32 µm was dissolved in the mixture of PSf (main polymer), polyvinylpyrrolidone (pore forming agent and hydrophilic additive) and n-methyl-pyrrolidone (solvent). The rate MIP / polymer solution was optimized according the extent of separation and porosity. The membranes were prepared by spin coating and phase inversion technique. Membrane porosity was evaluated by gravimetric method. The separation characteristics are still under evaluation using miniaturized flow system mimicking hemodialysis procedure. Two molecules with different sizes were selected as models: urea and bovine serum albumin, representing small molecules fully permeable for membrane and large protein, practically impermeable. In parallel, the selective extraction of p-cresol by MIP incorporated in the PSf membrane has been studied.

In conclusion, incorporation of MIPs specific for uremic toxins may bring new benefit to the hemodialysis membranes in order to improve removal of harmful compounds. However, more studies of the effect of MIPs on the PSf membrane morphology, physicochemical properties and biocompatibility are need to be carried out.

References

- ^[1] B. Lisowska-Myjak, *Uremic toxins and their effects on multiple organ systems. Nephron Clin Pract*, **2014**, 128(3-4), 303-11.
- ^[2] E. Turiel, A. Martin-Esteban, *Molecularly imprinted polymers for sample preparation: a review. Anal Chim Acta*, **2010**, 668(2), 87-99.

This work was financially supported by the Charles University Grant Agency, project GAUK 860216 and by project of specific research of Charles University, project SVV 260 412.