

**Author of the work:**

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**Title of dissertation thesis:** Development of new types of biocompatible haemodialysis membranes for separation of biomolecules

This dissertation thesis is focused on development, optimization, and testing of new flat sheet polysulfone membranes for haemodialysis (HD). The work presented in this thesis was carried out at three locations: Laboratory of Applied Chemistry and Laboratory of Biochemistry, Faculty of Pharmacy, University of Porto in Porto Portugal, and Laboratory of Flow Techniques at Faculty of Pharmacy, Charles University, Hradec Králové, Czech Republic. The thesis consists of 191 pages, includes 48 figures, 18 tables, and 279 references.

The theoretical part of the thesis deals on the one side with clinical and biochemical aspects of chronic kidney disease, end-stage renal disease, its complications, and treatment. On the other side, it describes haemodialysis membranes, their composition, geometries, preparation processes, and characterization methods. The entire theoretical part is composed very conscientiously and interestingly navigates the reader through the issues concerning preparation of new HD membranes.

The second part of the thesis consists of four main chapters and focuses on development, further testing, and results achieved with different types of membranes. Specifically, it concerns (i) development and characterization of flat sheet polysulfone membranes, (ii) development of bioactive membranes by incorporation of antioxidants, (iii) development of bioactive membrane enriched with neutrophil elastase inhibitors, and (iv) development of membrane incorporating molecularly imprinted polymer.

I very positively appreciate the practical benefits of the whole project. Specifically, I value the efforts to both improve life standards and reduce the side effects of patients treated with HD. Obviously, clinical testing is still required and, in my opinion, may not be easy. I also welcome the whole concept of testing and development of new membranes including numbers of different techniques and processes that the student had to understand and also learn to use in practice. Results of the work were materialized in three publications in journals with impact factor (IF about 3 and in first and second quartile according to the WOS) where Mgr. Kohlová is the first author, as well as in several oral and poster presentations at conferences. Her work also produced new membranes with a great potential for use in HD.

I have a few comments and questions related to the thesis that, however, do not reduce the positive evaluation of the entire work:

P. 38 and 48: Are any clinical studies known that deal with the determination of vitamin D metabolites (first and second line) in HD patients? Are these patients supplemented with this vitamin?

RPM (revolutions per minute) units are used in thesis, for characterization of centrifugation and spinning agitation. In my opinion, for better interpretation and reproduction of experiments, using “g” as the unit for centrifugation and agitation that refers to the

acceleration applied to the sample is much better. RPM is not very useful because the force varies with the radius of the rotor.

You were using different sets of membranes (for example P. 136 n = 3, P148,149 n = 4, P. 122,127 n = 5, P. 124 n = 8) during tests of their individual properties. What was the reason for this? Would not be better to use always a set with the same size?

P. 142 Table 13. Did you try to compare individual groups of different types of enriched membranes (PSf-ALA, etc.) with PSf membrane? Statistical results should be different.

P. 144 Table 14. One column is missing (PSf-ALA/ $\alpha$ -TCP)

P. 130 Journal title should be the "Journal of Materials Science"

Additionally, I have some more questions:

- How long requires the complete production of a new developed membrane and what are the costs?
- What are your plans for future testing of the developed membranes if any?

Presented Mgr. Kohlová's dissertation thesis meets all the requirements. Therefore, I recommended it for further proceeding and after successful defense, I suggest to award Mgr. Kohlová with Ph.D. degree in study program Bioanalytical methods.

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