

Report of the doctoral thesis

Title: *Bioactive polymer surfaces based on polyethylene*

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The thesis deals with a plasma treatment of polyethylene surface followed by chemical modification with bioactive compounds. Prepared bioactive polymer surfaces were tested for antibacterial activity, enhanced cell interaction and for thrombus formation, respectively.

The thesis is divided to three parts corresponding to the common form of standard thesis. The first one is theoretical background, the second one is description of experimental part and the final third one is "Results and discussions". At the end, the author's CV, List of figures, tables and abbreviations, references and list of author's publications are attached. It should be stated that text contains some imperfection, e.g. link to Figure X, however figures are labeled Figure X-Y (p. 10, 46); polyether sulfone is a type of polyester (p. 18); "and cc with a density range" (p. 15), when author thought of "HDPE with a density", non-uniform format of references etc.

The first part – Theoretical background introduces to topics – Biopolymers, polymers, biocompatibility, surface treatment, plasma treatment and bioactive surface coating. However, above mentioned topics are very broad and they can cover significant more pages than is range of PhD thesis, the author tried to briefly describe of selected topics with focus to his aims of work. This introduction is supported by over 120 references which are up to date (including 2015 and 2016).

In chapter 1.3. Polymeric biomaterials – the author claims "Natural polymers, also called biopolymers, are produced by living organism and basically divided to three according to repeated monomer units of saccharide, amino acid or nucleic acid.". *Question for author –*

could you class – polyhydroxyalkanoate (polyhydroxybutyrate PHB, polyhydroxyvalerate PHV, etc.) biopolymers produced by bacteria from sugar to one of the three above mentioned classes?

The second part – Experimental part, summarized used materials, preparation of samples and characterization techniques with short description of principle measurement. The author tried for the most comprehensive form with figures, but the only difference between figures 2-3, 2-4 and 2-5 is color of bioactive molecules. Also the first step of those schemes is at Figure 1-6. A symbol R in schemes of those figures is also a little bit confusing for readers. It means reagent (R – allylamines), but also an alkyl side chain in scheme of product. And it is not the same. *Could you show us full chemical structure at least of one final product?*

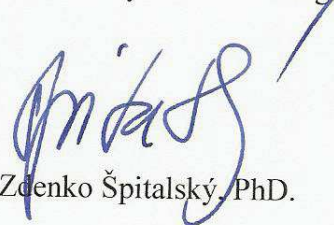
The third part – the most important part of thesis – Results and discussions. Author logically designed and discussed this part. It is divided to three subparts – according the measured biological activity. Every subpart follow scheme – water contact angle, FTIR, XPS, SEM, AFM, biological activity measurements and conclusion. However author reached all aims, some his results need a deeper explanation:

1. Used polyethylene. According the water contact angle measurements, there are three different starting materials – tab 3.1 - 91.9°, tab 3.4 - 85.3° (roughness 11.1 nm) and tab 3.6 - 85.3° (roughness 24.2 nm)
2. Sample SpF3. Author claims the lack or insufficient immobilization based on FTIR and XPS results. Do you have explanation for the highest Q_w ? Also from tab 3.3. where CFU for *E. coli* decreased from 4.3×10^6 to <1 for SpF3 sample.
3. Plasma treatment. The author used three different plasma activations (MW, RF and DC plasma) for three different biological activities. Could you explain your selection of combination plasma type – biological activity? Can you evaluate the best plasma treatment based on biological activity?

Conclusion

The thesis is fully acceptable as a basis for awarding the author by scientific degree “Philosophie Doctor” Ph.D.

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