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Děkanát Fakulty Technologické
Děkan
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29.04.2021, Brno

Review of the Doctoral Thesis “Functionalized biodegradable co-polyesters for medical applications”.

Author of the doctoral thesis: Maliheh Amini Moghaddam

Dissertation M.Eng. Moghaddam focuses on the modification of polylactide and the production of samples for medical applications. Due to the increasing importance of biodegradable polymers in tissue engineering and medicine, it is desirable to develop new biodegradable composites with properties adaptable to actual treatment requirements. Therefore, I consider the chosen topic of the dissertation to be actual and relevant.

The aim of the dissertation work of M.Eng. Moghaddam was to prepare and characterize (A) microcellular antibacterial PLA / ALUM composites and (B) PLA / PVAL porous systems loaded with gentamicin. The thesis is written in English on 78 pages plus 28 pages of appendices. It is divided into an abstract, introduction, theoretical background, aims of work, experimental part, a summary of work and contributions to science and practice. The theoretical part summarizes basic up-to-date information about biodegradable polyesters, biodegradation methods of polyesters, modification methods, and applications in medicine. The author of the dissertation work used 84 citations for the theoretical background.

The experimental part of the dissertation contains two chapters, which deal with the given aims of the dissertation. These chapters include text typical for scientific articles such as introduction, materials and experimental methods, results and discussion, and conclusion. In reality, these two chapters were already published in two impact journals (Polymers for Advanced Technologies, and Polymers), where the student was the first author.

The achieved results were summarized in the chapter Summary of work, but unfortunately very briefly. Similarly, in the chapter contributions to science and practice, it would be expected that the author of the dissertation would support the achieved results by own ideas of their future use.

I have comments on the formatting of the text:

1. The dissertation work contains many grammatical errors, typos, unnecessary spaces between sentences and words. For example, the abstract says "...for would dressing applications" or summary of work contains "...to make pours structure".
2. In the introduction, the student writes that PHAs are synthetic polymers, which is not correct.
3. Figure 16 shows SEM micrographs of microcellular PLA composites. Some information related to this image is missing or unclear. For example, the scale bar is missing. How big were found pores formed in the microcellular samples? It is not clear from the photos whether the specimens were in the form of extrudates received directly from the extruder or specimens processed in another way? There was no information about an additional processing process except for extrusion in the experimental part. Although, on the other hand, in part dealing with mechanical properties, it was mentioned that the mechanical properties were measured on the compression-moulded samples. It needs clarification. Furthermore, it is unclear if the SEM photos in Figure 16 were taken as surface morphologies or fractured morphologies.
4. What does it mean by "highly amorphous sample"?

Questions for the discussion:

1. Please, explain the differences and similarities between properties and possible target applications of microcellular PLA/ALUM/MSS composites in the submitted doctoral thesis and microcellular PLA / PHBV blends in the study of Zhao et al. 2013 (<https://doi.org/10.1021/ie301573y>).
2. Please, explain the difference between entrapment efficiency and the loading capacity of a drug in general view and from the point of the presented experiments. What information do these values give us?

Based on the presented work, it can be summarized that the PhD candidate has mastered the necessary experimental methods and achieved new results that can be used in polymer processing of polylactide for applications in medicine. The PhD candidate published the achieved results in two impacted journals and presented them at one conference.

I, therefore, recommend the thesis for defence.

Sincerely yours,

Assoc. Prof. Ing. Adriana Kovalčík, Ph.D.

