The review of the thesis by Ing. Diana Lazecka entitled "Biofilm creation study on polymeric nanocomposites"

The thesis has four main parts. The brief introduction includes the main objectives of the thesis. A chapter Theoretical part is thematically very extensive, which naturally results from the topic and the objectives. The theoretical part makes up almost half of the thesis. It includes the subchapters analyzing the current state of research on biofilms, their origin, and importance from the medical point of view. Another part is on polymer nanocomposites, analyzing this topic from the point of view of their applications in the prevention of biofilms. This chapter also presents basic knowledge about particular composites with the polymers used in the thesis. Antimicrobial substances also have their own subchapter. A relatively large part of the theoretical chapter is the characteristics of the methods used.

A chapter Experimental part is a very large describing the samples, procedures for the syntheses of the materials, and characterization methods. The results and their discussion are also part of this chapter. This arrangement is not very appropriate. I would recommend separating the section of Results and discussion from the experimental part. The last important part is Conclusions, which summarizes the most important results. The thesis also involves references, the lists of figures, tables, and papers by the author. I assume that the name Klushina D appearing in the list of the papers is the previous name of the author of the thesis.

The positive aspect of the thesis is the timeliness and interdisciplinary nature of the topic. Due to the complexity of the topic, a number of various tasks were needed to be investigated in order to achieve the objectives of the thesis. The difficulty of different topics, covering different areas of chemistry and biology, makes it very difficult to meet all the objectives or to be solved in sufficient depth to the full extent and in all partial problems that occurred during the study. The lack of a deeper analysis of some problems is a weak point of this work. The consequence is also that there is no obvious link between the different results obtained by physicochemical methods on the one hand and biological methods on the other. Thus, the results of individual methods may have scientific value themselves but do not sufficiently complement each other.

English of the thesis is at a low level with inconsistent grammar and many errors. Some wrong terms appear in the text. Bentonite is a clay, but not clay mineral (p. 55), nor smectite. What is meant by "very soft phyllosilicate group of minerals" (p. 36)? What are "human liquids" (p. 72)?

The graphical presentation is poor. Some labels in the figures are too small to be readable. They should be of similar size to the font used in the text. The style and format of the graphs are not uniform and the uniformity and similar format could be at least for the groups of figures such as XRD patterns, IR spectra, etc. The labels in some figures show values with non-significant digits. For example, this is the case of assigned d values of very broad reflections or peaks almost lost in the noisy background, for which we can estimate only approximate values.
have the following questions and comments:

1. The XRD patterns in Fig. 39 start at 5 degrees 2theta. However, modified vermiculites could exhibit reflections also at lower angles as the result of the expansion of the interlayer spaces. Vermiculates sometimes expand only at a fraction of interlayer spaces. We could verify the presence of a mixed-layer structure if the measurement starts at lower angles. The disappearance of the higher-order basal reflections indicates such changes. A similar question arises for some other XRD patterns (Figs. 47, 48). The reflection intensities increased with decreasing angle also in the patterns in Fig 47, but the measurement started at 5 degrees and the profiles at lower angles are missing.

2. The author carried the tests on the stability of composites out, but conclusions and details which processes took place are missing. Could you summarize which processes took place, which components were released from the solid, decomposed, or changed? Could you find some relations between these changes and the acid-base or other properties of these species?

3. It is not clear what was observed in Figures 93-95.

4. How did you prepare acetic acid solutions with different pH (5.1; 6.1; 7.0; 8.5; 9.8)?

5. Choose one result that you would consider being the most important from the view of scientific knowledge.

Diana Lezechka’s thesis represents an interdisciplinary study in which the author had to implement a wide range of methods of biology and chemistry. Despite some critical comments, the thesis is one of a few such interdisciplinary studies and brings the first knowledge that is valuable for orientation in such a complex scientific topic as the formation of biofilms on surfaces of modified polymer composites. Therefore, I recommend allowing Diana Lezechka to defend the thesis and after the successful defense; I recommend granting her a PhD degree.

In Bratislava, 11.11. 2019

prof. RNDr. Juraj Bujdák, DrSc.