

## **Opponent's report of doctoral dissertation**

on the topic

### **Development of polymer systems suitable for processing via advanced technologies of 3D printing and electrospinning**

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Study program: P2808/ Chemistry and Technology of Materials

Field of Study: 2808V006/ Technology of Macromolecular Compounds

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Opponent: prof. RNDr. Petr Ponížil, Ph.D.

The doctoral thesis authored by Ph.D. candidate Ing. Lenka Vítková spans 208 pages. The initial 5 pages provide an overview of the current state of knowledge and the goals of the doctoral work. The theoretical part encompasses 30 pages summarizing yet published theoretical insights into modern material preparation methods, such as 3D printing and electrospinning. Both of these technologies enable the processing of polymers into complex structures. The thesis focuses on crafting scaffolds which are prepared through a combination of these two methods and their nanostructure and surface properties are well-suited for cell cultivation.

The core of the work consists of a 15-page summary of findings from five articles authored by the researcher, which were published in impactful journals. The copies of these five articles are enclosed in the attachments.

The remaining obligatory sections of the thesis are of a very high standard. The bibliography is extensive, encompassing 348 sources. The current outputs of the doctoral candidate's work include six published articles, out of which five are in very reputable journals, and an additional two are under review. The candidate is the primary author of two of the already published articles and one of the submitted articles. This demonstrates a significant surpassing of the required publication outputs.

In terms of formal aspects, the work maintains a high language standard, with virtually no typographical or grammatical errors. Perhaps the only area for improvement could be the citations, as the author might consider relying less on automatic citation generation:

Citation [47]: APARICIO-COLLADO, J., CONSTANTINO, J. M.-M. T. C., VIDAURRE, A., SALESA, B., SERRANO-AROCA, A. and SERRA, R. S. Pro-Myogenic Environment Promoted by the Synergistic Effect of Conductive Polymer Nanocomposites Combined with Extracellular Zinc Ions. *Biology*. 2022, 11.

Correctly it should be: APARICIO-COLLADO, J. L., MOLINA-MATEO, J, CABANILLES, C.T.; VIDAURRE, A., SALESA, B., SERRANO-AROCA, A. and SERRA, R.S.I. Pro-Myogenic Environment Promoted by the Synergistic Effect of Conductive Polymer Nanocomposites Combined with Extracellular Zinc Ions. Biology. 2022, 11.

Apart from the already mentioned minor flaws, I haven't identified any further inaccuracies, which also speaks in favour of the quality of the work.

As the introduction of the discussion, I would like to ask 3 following questions:

1. Formula 4.1 on page 37 describes the force (or pressure?) pushing on the fiber in an electric field. The symbol "ds" is not defined. Could you please provide a clearer explanation of what this formula signifies?
2. Could you please explain what is shown in Figure 5.10? I assume that the thin filaments in the picture are made by electrospinning, while the thick filament across the width of the picture is the backing. But you can see the white beads, what are they?
3. In your work, you tried applying a magnetic field to the material. Wouldn't it be easier to use an electric field?

From the content of the thesis and the presented results, it can be affirmed that the general goals of the dissertation have been achieved. The manner in which the dissertation was conducted and the chosen methods of processing reflect the responsible approach of the candidate toward the selected subject. Also, from a formal perspective, the dissertation maintains a very high standard. The work is some of the best I have had the opportunity to review.

**In conclusion:** Based on the conducted evaluation, I can state that the content and composition of the doctoral thesis fully satisfy the conditions outlined in Section 47 of Act No. 111/1998 Coll. The author has demonstrated the capability for independent work in the field of research and the competence to address general specialized issues. The results of her scientific research work have been published at an international level, thus fulfilling the requirement for the publication of the doctoral thesis results. I recommend the thesis for defense, and considering the positive assessment provided, **I propose that upon a successful defense, the academic title of "Doctor," abbreviated as Ph.D., be conferred upon Ms. Ing. Lenka Vítková in the field of "2808V006/Technology of Macromolecular Compounds".**

Zlin, 10. 8. 2023

prof. RNDr. Petr Ponížil, Ph.D.