

Review of the Dissertation Thesis by Ing. Leona Mahelová entitled “Use of Polymers in Tissue Engineering”

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General Assessment

The dissertation, comprising approximately 115 pages, addresses a highly relevant and timely research topic with considerable potential to contribute to the field of biomaterials. The application of polymers in tissue engineering remains a relatively young area of research, with many open questions and challenges.

The structure of the thesis follows a conventional academic format: introduction, objectives, methodology, results, and conclusions. While the work contains a number of valuable findings, it does not fully succeed in achieving the ambitious aim of creating a “cohesive and harmonious symphony.” The most significant part of the dissertation—the results—is presented in a 30-page section, supplemented by 15 figures and a single table (which is, in fact, a summary of Figure 8.5).

Content and Structure

The **Introduction** provides a solid overview of tissue engineering, including relevant polymers, scaffold design, and final scaffold evaluation. It covers conductive polymers and biological testing in external fields, leading the reader to expect a corresponding focus in the Results section.

The **Experimental Section** spans 10 pages. Although presented in good detail, some important aspects are missing—for instance, the solvent used for preparing the PU solution in electrospinning is not specified (though I located this information in the accompanying article).

From page 53 onward, the **Results Section** begins—the most crucial component of the dissertation. It includes the preparation of electrically conductive polymers as thin films, the fabrication of polymer scaffolds, and cytocompatibility testing. However, the section that readers are likely most eager to see—tissue engineering under an applied electric field—is

condensed into only a short paragraph, with reference to the master's thesis. The same applies to experiments under external magnetic fields and mechanical stimuli. The dissertation concludes with an analysis of cell morphology visualization and image analysis.

The thesis demonstrates a strong engagement with the literature, citing 237 references. It also documents three publications by the author (including one as first author), which confirms the relevance and originality of the research.

Comments and Questions for the Candidate

1. On pages 18–19, PAz is described, but no information is provided on its biological effects. In contrast, such effects are mentioned for PANI and PPy. Could you clarify this point?
2. Could you provide a specific example of a scaffold coated with conductive polymers, and describe its response under an external electric field? Similarly, do you have results for scaffolds with CIP exposed to a magnetic field?
3. In Chapter 8.2.3, you discuss the work of R. Gorejová, PhD, on CIP scaffolds. One conclusion is that neither collagen nor gelatin improved the properties. Given that the materials were sintered first at 450 °C and then at 1120 °C, what effect would you expect these polymers to have?

Conclusion

The candidate has demonstrated solid expertise in the preparation of polymer scaffolds for tissue engineering, their modification with thin polymer films, and subsequent cytocompatibility characterization. This competence is further supported by the author's three publications.

On this basis, I recommend the dissertation for defense and propose that Ing. Leona Mahelová be awarded the academic title of **PhD**.

Bratislava, 17.8.2025

Z.Špitalský

A handwritten signature in blue ink, appearing to read "Špitalský", with a large, stylized flourish at the end.

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