

OPINION
on a dissertation
for acquiring the scientific degree “Doctor of Science”

Higher Education Area – **5. Technical Sciences**

Professional field - **5.6. Materials and Material Science**

Specialty - **Material Science and Technology of Machine Building Materials**

Author: **Assoc. Prof. PhD Eng. Tsanka Dimitrova Dikova**

Topic: **Properties of additively manufactured dental materials**

Scientific Jury member: **Prof. PhD Eng. Ivo Krastev Malakov**,
dep. “Discrete Manufacturing Automation”, FME, Technical University of Sofia

1. Topic and novelty of dissertation work

The dissertation work Dr. Dikova is devoted to a problem which has been the subject of intensive research in recent years, covering the study of factors and conditions influencing selected properties of dental constructions made from new materials through modern additive methods and techniques (3D printing, selective laser melting, etc.).

In this sense, I consider that the topic of dissertation work is current and the results obtained in it are of scientific and practical interest.

2. Research methods

Assoc. Prof. Dikova has worked actively and purposefully in the field of material science and technology for more than 20 years and has gained considerable theoretical, teaching and practical experience and competence in this field. This is also supported by the specializations at prestigious universities and research centers - Tokai University, Rice University, Saint-Petersburg Marine Technical University, as well as by her active participation in a number of significant international scientific forums in Russia, Germany, Turkey, Japan, Bahrain, Malaysia, India, Ukraine, France, Taiwan, Macedonia, Dubai, China, Poland and Italy.

On this basis and on the very good literary awareness (359 titles are cited in the dissertation thesis), the candidate has chosen a suitable modern methods - experimental and analytical methods, regression and simulation analysis, multicriteria optimization, applied software, etc. In addition, the improved technologies, proposed by the author, and algorithms for their application are used for manufacturing of temporary and permanent fixed dental prostheses. Two new research methods have been developed. With their help

and in conjunction with the conventional methods, investigations of different properties were carried out: accuracy and roughness; density, microstructure and chemical composition; hardness; tensile strength and adhesion strength of coatings to dental alloys; bending strength and tribo-corrosion.

I consider that the research methodology, chosen by the candidate, is adequate to the aim and tasks of the dissertation, which fully correspond to the achieved results and contributions. I would like to emphasize her technical sensitivity and precision in the preparation and conducting of the numerous experiments.

3. Contributions of the dissertation work

I accept the report of contributions, some of which can be edited and summarized for emphasizing their character and nature. I believe that the contributions, formulated in the report, reliably reflect the essential aspects of the dissertation.

The dissertation work is prepared by herself and does not repeat the topic and content of the dissertation for acquisition of the educational and scientific degree "doctor" (PhD).

4. Publications and citations of dissertation publications

The author has presented 24 scientific publications on the dissertation. Five of them are self-written, as one chapter of a book and two of the publications being in world-indexed databases of scientific information. The other 19 publications are co-authored, as 11 of them are published in global databases. The citations of the papers related to the dissertation are 22. Twelve of these are in publications, referenced and indexed in world-famous databases.

The publications, presented in the dissertation work, reflect sufficiently complete and accurate parts of its content and promote the work done.

5. Authorship of the results obtained

I believe that the contributions of the dissertation are a personal work of the author.

6. Remarks on dissertation work

I have no critical remarks of an essential nature about the dissertation thesis presented.

Note can be made regarding the mathematical model of the multicriteria optimization task, in which the priority of the target functions and the restrictive conditions defining the acceptable area of the solutions are not clarified. The work would benefit if the decision of

the task was explored at a different "importance" of the selected criteria. I consider that it is necessary to justify the choice of properties that are in the focus of research in the dissertation because each object possesses many properties. The same applies to the criteria for evaluating the applicability of dental materials in medicine.

I recommend the candidate to pay attention in the future work to the economic efficiency, which is one of the main factors determining the competitiveness and market success of the new materials, technologies and products.

7. Conclusion

The presented thesis contains sufficiently scientific and applied scientific contributions, which are valuable from both the theoretical and the applied point of view. It is result of many years of research performed by the author in the field of dental materials, whose work has been reflected and evaluated in a number of prestigious publications both in Bulgaria and abroad. Assoc. Prof. Tsanka Dikova has the name of a recognized expert on the subject of her dissertation among the scientific community.

I consider that the submitted thesis corresponds to the requirements for acquiring the scientific degree "Doctor of Science" and is in compliance with the Law on the Development of the Academic Staff in the Republic of Bulgaria (LDASRB), the Regulations for the Application of LDASRB and the Rules of the Technical University - Gabrovo for the implementation of the LDASRB. My evaluation is positive.

The results achieved give me grounds to propose Assoc. Prof. Tsanka Dimitrova Dikova to acquire the scientific degree "Doctor of Sciences" in the higher education area 5. Technical sciences, professional field 5.6. Materials and material science, specialty "Material science and technology of machine building materials".

06 June 2019

Scientific Jury member: /signature/

(Prof. Ivo Malakov, PhD)