REVIEW

in a competition for acquiring the academic position of "Professor" in the Field of higher education 5. Technical Sciences Professional direction 5.6. Materials and Materials Science, Scientific specialty "Materials Science and Materials Technology",

promulgated in SG № 53 /12.06.2020 by the Medical University – Varna "Prof. Dr. Paraskev Stoyanov", for the needs of the Department of Dental Materials Science and Propaedeutics of Prosthetic Dentistry at the Faculty of Dental Medicine

Reviewer: Professor Galya Velikova Duncheva, DSc

1.General description of the submitted materials

The sole candidate is Tsanka Dimitrova Dikova, Assoc. Prof. in the Department of Dental Materials Science and Propaedeutics of Prosthetic Dentistry at the Faculty of Dental Medicine of the Medical University - Varna "Prof. Dr. Paraskev Stoyanov ". The candidate, Assoc. Prof. Tsanka D. Dikova, participates in the competition with a total of 69 scientific papers, divided into the following groups:

◊ *Group I, including 29 scientific works to meet the minimum national requirements for acquiring the academic position of "Professor" according to ZRASRB from 2018, of which:*

- 1 number PhD dissertation "Study of the behavior of 5HNM, 3X2V8F and 4X5MFS steels under laser and thermocyclic impacts (A-1);
- 1 number DSc dissertation "Properties of layer-by-layer produced dental materials" (Б-1);
- 1 number published habilitation thesis - monograph "Cobalt-chrome dental alloys produced by selective laser melting" (B-3);
- 1 number published scientific work, classified by the candidate as a monograph, which is not presented as a main habilitation work "Design of cold sheet metal stamping equipment" (I-G-5);
- 9 numbers scientific issues publications, referenced and indexed in world-famous databases of scientific information (Scopus, Web of Science (WoS)) (I-Г-7-1 - I-Г-7-9);
- 12 numbers publications in peer reviewing journals and procedeenigs, unreferred in world-famous databases with scientific information (I-Г-8-1 - I-Г-8-12);
- 4 numbers published university textbooks: Dental Materials Science, Part 1 (E-23-1); Dental Materials Science, Part 2 (E-23-2); Dental Materials Science, Lectures and Laboratory Classes Notes, Part I (E-23-3); Dental Materials Science, Lectures and Laboratory Classes Notes, Part II (E-23-4).

◊ *Group II comprising 40 scientific works outside the minimum scientometric requirements, divided by the candidate into two subgroups, as follows:*

- II-A - 19 numbers full-text publications in foreign scientific journals and international forum proceedings - conferences and congresses (II-A-1 – II-A-19);
- II-Б - 21 numbers full-text publications in Bulgarian scientific journals and proceedings of scientific forums in Bulgaria (conferences and congresses) (II-Б-1 - II-Б-21).

Based on my acquaintance with the above-mentioned scientific works, I consider that they are all in the field of competition, with the exception of papers II-Б-10 and II-Б-11. The latters contain trivial information about basic operations and the application of the AutoCAD software product. The predominant part (52 scientific works) of the remaining 67 scientific works are published in English, 13 - in Bulgarian (A-1, B-3, I-Г-8-1, I-Г-8-8, I-Г-8-11, I-Г-8-12, II–Б-3, II–Б-4, II–Б-6, II –Б-7, II –Б-13, II –Б-15, II –Б-16)) and 2 scientific workss (II–A-7, II–A-16) - in Russian.
Assoc. Prof. Tsanka Dikova is the sole or first author in more than half of the publications, which proves the decisive role of her personal contribution.

3. Evaluation of the research and scientific-applied activity of the candidate

Out of the publications included in the PhD, Associate Professor and DSc procedures, the subject of special attention are the scientific works included in Group I (to meet the minimum national requirements for acquiring the academic position of "Professor").
Currently in the scientific community (I have direct observations on the scientific community in the field 5. Technical sciences) outside the definition of at least 100 standard pages, rather there are no approved criteria for the main characteristics of the "monograph" as a type of scientific work. In the context of academism and the item 10 content of "Additional, transitional and final provisions of ZRAS/2018, the main characteristics of the "monograph" are clearly defined: the presence of an original contribution based on own research on a scientific problem relevant to science and practice, which problem has been studied comprehensively and in depth, applying modern methods and techniques. From this point of view, the printed scientific work "Cobalt-chrome dental alloys produced by selective laser melting " (B-3) corresponds to the specified characteristics. Applying the above criteria, I consider that the claim of the candidate for a monograph regarding scientific work " Design of cold sheet metal stamping equipment " (I-G-5) is unfounded. By the way, according to the text written by the author in the introduction, this work is classified as a "practical guide" and confirms the lack of original contribution to science and practice. This paper is methodological guide focused on a specific problem in the field of mechanical engineering design - design of cold sheet metal stamping equipment. On the other hand, this work is based on the long-term experience of Assoc. Prof. Ts. Dikova as a designer of tool equipment, which makes it especially useful for practice.
All 9 scientific воркс published in scientific issues, referenced and indexed in world-famous databases with scientific information (Scopus, WoS) (I-Г-7-1 - I-Г-7-9) are essentially applied research oriented to dental and general medicine, and in particular "Application of 3D printing technologies - stereolithography with laser and light projection, material layering and selective laser melting in dental medicine" and "Nanomaterials in mechanical engineering, general engineering and dental medicine, nanoengineering coatings on titanium for biomedical applications".
According to the rating of the publication place, this group of scientific papers has been published as follows:
◊ *In international journals with Impact Factor:*
- 1 article (I-Г-7-3) with IF 2018 = 0.32 and SJR 2019 = 0.265 in Russian Metallurgy (Metally) - journal indexed by WoS and Scopus, published by Springer;
- 1 article (I-Г-7-8) with IF 2019 = 2,753; SJR 2019 = 0.403 in Processes - open access journal indexed by WoS and Scopus, published by MDPI AG, Basel, Switzerland;

◊ *In international and Bulgarian journals indexed by WoS and Scopus:*

- 3 articles (I-Г-7-2, I-Г-7-5, I-Г-7-6) with SJR 2018 = 0.22 in Archives of Materials Science and Engineering - journal indexed by Scopus, published by Index Copernicus Corporation, Poland;
- 3 articles (I-Г-7-1, I-Г-7-7, I-Г-7-9) respectively with: SJR 2017 = 0.103; SJR 2019 = 0.108; SJR 2017 = 0.103; in J of IMAB - Bulgarian open access journal indexed by WoS and Scopus, published by the International Medical Association Bulgaria (IMAB);

◊ *1 Book Chapter published in Lecture Notes in Networks and Systems, Springer edition, indexed by Scopus (I-Г-7-4) with SJR 2019 = 0.125.*

Most of the publications in peer-reviewed journals and proceedings, unreferred in world-famous databases with scientific information (I-Г-8-1 - I-Г-8-12) are thematically focused on these two research directions. A total of 12 scientific works have been published in this group, as follows:

◊ *In Bulgarian journals:*

- 5 articles (I-Г-8-4, I-Г-8-5, I-Г-8-6, I-Г-8-9, I-Г-8-10) in Int. J. "Machines, Technologies, Materials, issued by the Scientific and Technical Union of Mechanical Engineering;
- 1 article (I-Г-8-3) in Int. J. "Materials Science. Non-Equilibrium Phase Transformations ", issued by the Scientific and Technical Union of Mechanical Engineering;
- 1 article (I-Г-8-7) in Scripta Scientifica Medica - journal published by the Medical University - Varna;

◊ *At international conferences and workshops in Bulgaria:*

- 1 report (I-Г-8-1) at the International Conference "Industry 4.0";
- 1 report (I-Г-8-2) in the Workshop Proceedings NANOSCIENCE & NANOTECHNOLOGY (Proceedings of the Fifteenth Workshop Nanostructured Materials Application and Innovation Transfer, 2013, Sofia, Bulgaria;
- 1 report (I-Г-8-8) in proceedings of the 8 Int. Sci. Conf. for young scientists "Technical Science and Industrial Management", Varna, 2014;
- 2 reports (I-Г-8-11, I-Г-8-12) at the Varna Medical Forum (issued by the Medical University-Varna);

The most scientific works of group II, i.e. those outside the minimum national requirements, thematically are in the folowings research directions: "Unconventional and surface heat treatment of alloys with concentrated energy fluxes - laser, plasma, electron beam"; "Corrosion processes in stainless, heat-resistant and tool steels with application in dentistry and mechanical engineering".

According to the rating of the publication place scientific works outside the minimum national requirements of subgroup II-A are published as follows:

◊ *In foreign journals with Impact Factor*:

- 1 article in Metal Science and Heat Treatment (II-A-8) with IF (2012) = 0.151 - journal indexed by Scopus, published by Springer;
- 1 article in Russian Metallurgy (Metally) (II-A-17) with IF (2017) = 0.21 - journal indexed by WoS and Scopus, published by Springer;

◊ *In foreign journals indexed by Scopus with Scientific Journal Ranking (SJR), of which:*

- 6 articles in Advanced Materials Research - (II-A-1 (SJR 2010 = 0.155), II-A-2 (SJR 2010 = 0.155), II-A-5 (SJR 2011 = 0.149), II-A-6 (SJR 2011 = 0.149), II-A-9 (SJR 2017 = 0.135), II-A-11 (SJR 2014 = 0.14);

• 1 article in AIR Conference Proceedings (2011) (II-A-4);
• 2 articles in Advances in Materials and Processing Technologies (II-A-13 (SJR 2019=0.235), (II-A-14 (SJR 2019=0.235);
◊ *In foreign journals which not indexed by WoS and Scopus:*
• 1 article in Metallurgy and Heat Treatment of Metals (MiTOM) (II-A-7), journal published in Russia;
• 1 article in Recourse Saving Technologies for Production and Pressure Shaping of Materials and Machine Building (II-A-10) - journal published in Ukraine;
• 1 article in Metals (II-A-16) - journal published in Russia;
◊ *At international conferences, congresses and workshops – a total of 5 reports, of which:*
• 1 report in Proceedings of the 8-th Workshop on Application of Laser in Mechanical Industries WALMI 2010, Calcutta, India (II-A-3);
• 1 extended abstract in the Book of extended abstracts of VI-th Int. Metallurgical Congress MME 2014, Ohrid, Macedonia (II-A-12);
• 1 report in Proceedings / VII-th International Metallurgical Congress 2016, Ohrid, Macedonia (II-A-15);
• 1 report in Proceedings of the 19-th International Metallurgy and Materials Congress IMMC 2018, Istanbul, Turkey (II-A-16);
• 1 report in Proceedings of the 13-th International Conference on the Mechanical Behavior of Materials (ICM-13) 2019, Melbourne, Australia (II-A-19).
The scientific works from subgroup II-Б include a total of 19 publications, of which: 14 in Bulgarian scientific journals, publications of BAS, Scientific and Technical Union of Mechanical Engineering, Medical University - Varna and Technical University of Gabrovo - (II-Б-2, II-Б -3, II-Б-5, II-Б-7, II-Б-8, II-Б-9, II-Б-12, II-Б-13, II-Б-14, II-Б-15 , II-Б-17, II-Б-19, II-Б-20, II-Б-21); 5 in Proceedings of conferences in Bulgaria (II-Б-1, II-Б-4, II-Б-6, II-Б-16, II-Б-18).
According to the information contained in the "List of participations in international and national scientific events", the candidate - Assoc. Prof. Ts. Dikova, participated with a total of 56 oral presentations submitted for participation in the competition for "Professor", of which - 23 participations in abroad and 33 events in Bulgaria. The list of forums abroad is impressive - Serbia, Australia, Macedonia, Italy, Russia, France, Poland, China, the United Arab Emirates, Turkey, Taiwan, Ukraine, Belgium, India, Malaysia, Bahrain. The reports submitted for participation in the competition for "Professor", presented at conferences and printed in abstract, are a total of 30, of which 22 are from conferences abroad. Assoc. Prof. Dikova is a member of the Scientific Committee of four scientific forums abroad, a member of the Program Committee of an international conference abroad (Poland) and an international conference in Bulgaria, Deputy Chairman of the Program Committee of an international congress in Bulgaria, Chairman of the Organizing Committee at an international conference in Bulgaria, etc.
She is an invited lecturer at 13 scientific events, 10 of which are abroad. This organizational activity shows that Assoc. Prof. Dikova is known in the scientific community in the field of material sciences. I highly appreciate her work as a reviewer, which includes: 4 reviews of dissertations and habilitations (3 of which abroad and 1 in Bulgaria) and 4 opinions; reviews of 3 numbers projects, 1 review of a monograph abroad published by Springer; 60 numbers reviews of articles, of which 26 for journals with Impact Factor (of which 7 reviews in the Journal of

Materials Engineering and Performance), 20 for international journals and 14 for journals published in Bulgaria.
Summarizing the statistics for the publishing activity in the field of the competition (excluding the textbooks), out of a total of 63 scientific papers, 12 scientific works are review papers (I-Г-7-1, I-Г-7-9, I-Г-8-7, I-Г- 8-10, I-Г-8-12, II-Б-1, II-Б-2, II-Б-3, II-Б-4, II-Б-9, II-Б-15, II-Б-17).
In accordance with the specifics of the competition, an experimental approach is applied in other scientific publications, using up-to-date research methods - SEM analysis, Energy-dispersion X-ray analysis (EDAX), XRD analysis. A total of 4 articles have been published in journals with Impact Factor, and 16 publications are with SJR. Publications with Impact Factor in quantitative and qualitative aspects (number of articles and value of Impact Factor) are an internationally recognized indisputable criterion for the level of scientific production. From this point of view, the asset of Assoc. Prof. Ts. Dikova is rather small in the context of the competition for the academic position of "Professor" and the demonstrated international activity at scientific forums.
According to the academic reference prepared by the library of Medical University - Varna for the citations by foreign and Bulgarian authors, in the databases of WoS, Scopus and Google Scholar a total of 34 citations of the publications of Assoc. Prof. Dikova have been noticed. According to google scholar citation she has h-index = 9.
Assoc. Prof. Dikova participated in the competition for "professor" with five research projects, two of which are based on international scholarships won - a scholarship from Tokay University, Japan and a Fulbright scholarship from the Bulgarian-American Fulbright Foundation for a 5-month specialization at Rice University, USA; one national project at the NSF - MES and two - university projects - at Medical University - Varna.
The engineering and implementation activities of the candidate include 31 engineering projects implemented in practice, developed by and under the leadership of the candidate for the company "Mauer Locking Systems" Ltd., Varna: Projects, new products, equipment - 5 projects; Research, simulations, optimizations - 11 tasks; Development and implementation of tooling - 10 tasks; Standards, procedures and company norms - 5 numbers. Proof of the high degree of expertise of Assoc. Prof. Ts. Dikova in material sciences is her election as a national expert in materials science and heat treatment of metals at the Scientific and Technical Union in Mechanical Engineering in 2013.

4. Evaluation of the educational activity and qualification of the candidate

The candidate is Assoc. Professor at Medical University - Varna "Prof. Dr. Paraskev Stoyanov" since 2007, Department of Dental Materials Science and Propaedeutics of Prosthetic Dentistry at the Faculty of Dental Medicine. She participated in the competition for "Professor" with 4 textbooks, two of which in English.
Six lecture courses have been developed: "Dental Materials Science", "Dental Materials Science, Apparatus and Instruments", "Nanomaterials and Nanotechnologies in Medicine" in Bulgarian and English and "New Products - Technological Stages and Application of Software Products in Their Production" - for students from Medical University -Varna on internship in the "Mauer Locking Systems Ltd." In 2011-2012, a thematic series of lectures "Structural and technological documentation, measuring instruments and measurements" was presented in order to refresh

and improve the skills of workers from the Production Directorate and Quality Directorate of the company "Mauer Locking Systems Ltd."
The candidate has read 8 lectures at foreign universities: in 2005, 2017, 2018 in Tokay, Japan; 2011, 2012 respectively at Rice and Davenport Universities, USA; 2015 - at Xidian University, China. Assoc. Prof. Dikova is the scientific supervisor of 10 graduates, 1 of which is from Japan. Under her guidance, 4 PhD students successfully defended their PhD theses.
In 2012, Assoc. Prof. Tsanka Dikova was awarded a gold badge "Prof. Asen Zlatarov" of the Federation of Scientific and Technical Unions in Bulgaria for creative contribution and high results in science and technology.
From the point of view of lecture courses, printed textbooks, work with students and PhD students, excellent English and Russian language and expertise in the field of material sciences, the qualification of Assoc. Prof. Ts. Dikova, necessary for the academic position of "Professor" is convincing.

5. Basic scientific, scientific-applied, and applied contributions
In the context of the competition, the candidate's asset in terms of scientific contributions is of particular importance. That is why I will focus on them. I refer the scientific contributions to the category "*New facts obtaining*":
- For the first time the stages of formation and growth of titanium nanotubes were observed and different mechanisms of formation of titanium nanotubes on the surfaces of pure titanium and Ti-6Al-4V alloy were established;
- For the first time, carbon nanotubes were synthesized by Chemical Vapor Deposition (CVD) process on anodized surfaces of pure titanium and Ti-6Al-4V alloy without the use of a metal catalyst in the form of nanoparticles;
- Nanoparticles of CdS and gold were synthesized by various chemical methods and a comparative analysis of their optical properties was made;
- The microstructure, phase composition and properties of tool, heat-resistant and austenitic steels, surface treated or welded with additional material by means of laser and subjected to additional thermal, thermo-cyclic or chemical impacts have been established;
- The structural features of martensite and residual austenite in cast irons subjected to concentrated energy flows and the mechanism and morphology of ferrite changes under laser and electron beam exposure to Fe-C alloys have been established.

I do not accept the scientific contributions with numbers 1.2 and 1.3, presented in the author's reference, as they are already the recognized asset in the DSc procedure. I accept the classification and formulation of the scientific-applied and applied contributions presented by the candidate.

6. Significance of contributions to science and practice
Scientific, scientific-applied and applied contributions enrich scientific knowledge and practices in the field of modern dental materials science, nanomaterials in mechanical engineering, general and dental medicine, unconventional and surface heat treatments of alloys with concentrated energy fluxes with laser, plasma and electron beam.

7. Critical remarks and recommendations

I have the following remarks on the scientific works presented in the competition:

- Scientific paper II-A-8 is a translation into English, published in Metal Science and Heat Treatment, of scientific paper II-A-7, published in the Russian journal Metallurgy and Heat Treatment of Metals (MiTOM). Regardless of the accepted practice in scientific journals in Russia, the result is two scientific publications with one and the same content;
- From the point of view of the research metology, the object of research (pure Ti and/or titanium alloy Ti-6Al-4V in the aspect of surface morphology after anodization) and research methods, scientific papers I-Г-8-2, I- Г-8-5, II-A-10 and II-A-11 do not differ significantly.

This "reproducing" undoubtedly multiplies scientific publications in quantitative aspect, but does not increase their quality.

Given the specifics of the scientific topic, developed by Assoc. Prof. Dikova, I think that the optimization procedures, set and solved in an appropriate way, are a powerful "tool" to achieve a combination of quality characteristics of the studied materials in correlation with specific application in dental, general medicine or mechanical engineering. In the future, I recommend Assoc. Prof. Dikova to include one-obgective and/or multi-objective optimizations in the research process.

8. Personal impressions

As Chairman of the Scientific Jury in the procedure for defense of DSc dissertation I was impressed by the convincing performance of Assoc. Prof. Dikova. I think that she is an approved scientist in the scientific community of material sciences at home and abroad.

9. Conclusion

The assets of Assoc. Prof. Ts. Dikova by groups of indicators meet the minimum national requirements for acquiring the academic position of "Professor" according to ZRASRB/2018. On this basis, and after my acquaintance with her research, teaching and expert activities, I offer:

Assoc. Prof. Tsanka Dimitrova Dikova to take the academic position of "Professor" at the Medical University - Varna "Prof. Dr. Paraskev Stoyanov", in the Field of higher education 5. Technical sciences, Professional direction 5.6. Materials and Materials Science, Scientific specialty "Materials Science and Materials Technology".

23.09.2020 r.

REVIEWER:

/Prof. Galya V. Duncheva, DSc/