

REVIEW

**Regarding a competition announced by the Technical University of Varna,
to occupy an academic position "Associate Professor"
in the field of higher education 5. Technical Sciences,
professional direction 5.1 Mechanical engineering,
study discipline "Technology of materials",
promulgated in SG, no. 2 of 05.01.2023,**

Reviewer: Professor Jordan Maximov, DSc, PhD

Only one candidate participated in the competition: Tatyana Mitkova Mechkarova, Ph.D., born on 13.12.1979. She works at TU-Varna, Department of "Materials Science and Materials Technology", and holds the academic position of "assistant".

1. Evaluation of the scientific-research, scientific-applied and publication activity of the candidate after the procedure for PhD degree

According to this indicator, the candidate Assistant Professor Tatyana Mechkarova participated in the competition with an asset that I have classified as follows, regardless of the author's view expressed in the relevant lists:

1) Dissertation abstract on "Optimization and research of indirect plasmatron for chemical-thermal treatment of titanium alloy Ti-6Al-4V" for obtaining the educational and scientific degree "PhD" – **1**;

The dissertation is on the doctoral program "Engineering Materials Technology".

2) Articles in journals with impact factor indexed by Web of Science and Scopus – **1**. The journal, the number of authors and the applicant's place among the authors are:

▪ Materials, IF=3.4 (2022, Web of Science): publication B.4.10* (7 authors, VII author).

3) Articles in refereed journals without an impact factor – **9**. The journals, the number of authors and the applicant's place among the authors are:

▪ UPB Scientific Buletin, Series D: Mechanical Engineering, SJR 0.172 from 2022, edition of Technical University - Bucharest, Romania, 2 publications: B.4.2 (5 authors, II author) and B.4.3 (5 authors, II author).

▪ IOP Conference Series: Materials Science and Engineering, 5 publications: B.4.4 (5 authors, II author), B.4.5 (5 authors, II author), B.4.7 (4 authors, III author), B.4.8 (5 authors, III author) and B.4.9 (5 authors, III author).

▪ A multi-disciplinary journal TEM Journal – Technology, Education, Management, Informatics, 2 публикации: B.4.6 (3 authors, III author) and B.4.11 (4 authors, IV author).

4) B Proceedings of the Second International Scientific Conference "Intelligent information technologies for industry", 2017, Vol. 2 (as a co-organizer of the conference is TU - Varna) – **1**: B.4.1 (4 authors, II author).

* The numbering is according to the one made by the candidate in file 7.3 "Reference for..."

5) Publications in non-refereed journals – **30**: Г8.1 (3 authors, III author), Г8.2 (4, III), Г8.6 (3, I), Г8.7 (3, I), Г8.12 (1, I), Г8.13 (1, I), Г8.14 (1, I), Г8.15 (1, I), Г8.16 (4, III), Г8.17 (3, II), Г8.18 (4, I), Г8.19 (2, I), Г8.20 (2, II), Г8.21 (2, II), Г8.22 (4, II), Г8.23 (4, II), Г8.24 (4, I), Г8.25 (4, III), Г8.26 (3, III), Г8.27 (4, I), Г8.28 (3, III), Г8.29 (4, I), Г8.30 (3, III), Г8.31 (3, I), Г8.32 (3, III), Г8.33 (3, III), Г8.34 (3, I), Г8.35 (2, I), Г8.36 (3, II) и Г8.37 (3, II).

6) At scientific conferences in Bulgaria – **7**: Г.8.3 (2 authors, I author), Г.8.4 (3, III), Г.8.5 (2, I), Г.8.8 (3, III), Г.8.9 (3, III), Г.8.10 (3.III), Г, 8.11 (3, III).

With the exception of the thesis abstract, which has already been reviewed, I accept to review all the works (48 in number), since, in my opinion, they can be classified under "Materials Technology". Elementary statistical analysis shows the following:

* Publications from group B4 are the most important, as they must be equivalent to a monographic work, as required by the Law on the Development of the Academic Staff in the Republic of Bulgaria (LDASRB). There is no independent publication (without co-authors) among them. There is also no article in which the candidate is the lead (first) author. In 5 articles the candidate is the second author, in 4 articles he is the third author, in one article he is the fourth author, and in one article (the only one with an impact factor) he is the seventh author. In this group of posts, the lead role of the candidate should be seen. However, statistics show the opposite.

* Four of the publications from the G8 group are self-contained. In 12 articles the candidate is the lead (first) author, in 7 articles he is the second author, and in 14 articles he is the third author. In this group of publications, the role of the candidate is far more convincing than in group B.

The results of the research work of Assistant Professor Tatyana Mechkarova can be summarized in two main groups:

1) Study of the structure and properties of materials (B4.1 – B4.11, Г8.1-Г8.5, Г8,6-Г8.9, Г8.14-Г8.17, Г8.19, Г8.22, Г8-25, Г8.26-Г8.37);

2) Research and modeling of technological processes (Г8.10, Г8.13, Г8.16, Г8.18, Г8.20-Г8.24).

At the present moment, it is difficult to give an unequivocal answer to the question of what the candidate looks like as a scientific worker (in this term, any pedagogical nuances are excluded) - innovator, experimenter, analyst, translator of ideas. I believe that the candidate has yet to establish himself as a real scientist with a recognizable profile.

The citation list of his works submitted by the candidate showed 17 citations. Of these, 6 are by foreign authors, and the two cited works are devoted to polymer composites.

Assistant Professor Mechkarova has submitted a certificate of participation in 9 research projects for the period 2021-2023, of which she has been the leader, which is (in every aspect) remarkable. From another reference related to the construction of laboratories, it is clear that during the period 2019-2023, Dr. Mechkarova has participated in 7 more research projects, 6 of which she was the head of. In addition, Dr. Mechkarova has participated in 4 more projects, 3 of which she has been the leader of, related to the construction of a research complex at the Student Marine Club, of which she is the leader.

Another reference shows that for the period 2017-2023 the candidate has participated in 12 scientific conferences.

In conclusion, I can note that after the defense of the dissertation (PhD), Tatyana Mechkarova has shown remarkable activity in scientific research, scientific application and publication activities.

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

Ас. д-р Татяна Мечкарова е участвала в разработването на две учебни програми:

- 1) Educational and Qualification Degree (EQD) "Bachelor" – Обработване на металите чрез пластична деформация;
- 2) EQD "Bachelor" – Технология за рязане и заваряване.

From a report on Dr. Mechkarova's study load in the last three years, it can be seen that she has lectured on 5 academic disciplines (EQD "Bachelor") and led exercises on 8 academic disciplines (EQD "Bachelor"). Under the leadership of Assistant Professor Mechkarova, five students successfully defended their diploma theses (EQD "Bachelor") and as many in the EQD "Master". Dr. Mechkarova actively participates in building the material base of the university and in particular of the Department of Materials Science and Materials Technology:

- 1) Laboratory "Structural analysis, filming and research of technological objects";
- 2) Laboratory for macro- and micro-metallographic analysis;
- 3) Construction of a research complex at the Student Marine Club.

Dr. Mechkarova has presented a certificate of acquired qualification. Under the "Erasmus" program, she has visited: the National Technical University of Athens; The Mediterranean Institute of Management in Cyprus; The University of Galați, Romania; University of Western Attica, Greece; The International Hellenic University, based in Thessaloniki, Greece; Ovidius University of Constantza, Romania; Naval Academy, Romania.

Based on the above, I believe that Assistant Professor Dr. Tatyana Mechkarova has the necessary pedagogical training and qualification to occupy the academic position of "Associate Professor" at TU Varna.

3. Meeting the minimum requirements for holding the academic position of "associate professor" set out in the 2019 LDASRB

The candidate Dr. Tatiana Mechkarova participated in the competition (group B, indicator 4) with 11 scientific articles (B4.1 - B4.11), presented as equivalent to a habilitation thesis on the topic: "Research structure and properties of materials ". One of the articles is in a journal with an impact factor, and the rest are in low-ranked publications. With the minimum required 100 points, the applicant's asset is 145.57 points. I think the wording of the topic sounds too general. Since the LDASRB requires these 11 publications to be equivalent to a monographic work, the obligatory dose of specificity must be present in the title. It is not known to me a monograph with such a generic sounding title.

According to indicator groups Г and Д, Dr. Mechkarova's assets significantly exceed the minimum national requirements. The same applies to the additional requirements of TU Varna.

4. Main scientific-applied, applied contributions and teaching-methodical contributions

I do not accept the applicant's claims for scientific and applied contributions related to finite element (FE) models of the effect of the welding process on the physical-mechanical

behavior of the material. This is an extremely complex problem that has not been solved well enough to date. The complexity stems from the following: 1) A fully coupled transient thermo-mechanical FE analysis is required; 2) From the core to the periphery, the metal passes in reverse order through its three aggregate states; therefore three types of finite elements (FE) are required; I don't know enough reliable FEs for the first two states (in reverse order); 3) The three forms of heat transfer (conductive, convective and radiation) are accompanied by mass transfer (due to evaporation); 4) Conductive thermal conductivity coefficients are pseudo-coefficients: they are a function of temperature, and after 600°C I don't know any specialist who knows this function for a particular material; 5) Analogous is the problem with pseudo-constants in the other two forms of thermal conductivity, with which temperature boundary conditions must be defined. And so on. And on top of that, the candidate used layman's software. I take the liberty of calling for more respect for science.

I also do not accept the author's defined contribution to the effect of surface plastic deformation, since there are hundreds of articles in high-level international scientific journals with an impact factor (as a reviewer in such journals, I have reviewed dozens of articles on this subject), in which these problems are solved, including for such materials.

Regardless of the author's view, my accepted contributions are summarized and classified as follows:

1) *Scientific applied contributions*

- A combined approach to improve the service behavior of aluminum bronze with β -transformation.
- A model of crack initiation and growth in a metallic component under high-cycle fatigue conditions
- Correlation between matrix composition and type of reinforcing phase on the one hand, and optimal mechanical properties on the other hand, of polymer matrix composites.
- Methods for researching the structure and properties of materials.
- Regression models of the correlation between the governing factors (technological modes) and the structure and properties of materials.

2) *Applied Contributions*

- Database of mechanical properties and structures of welded joints and other materials.
- Benches and laboratory setups for determining mechanical properties, corrosion behavior and corrosion stress.

3) *Teaching and methodical contributions*

- I accept the applicant's claims for teaching-methodical contributions (2 study programs).

5. Significance of contributions to science and practice

The results of the scientific-research and teaching-methodical activities of Assistant Professor Tatyana Mechkarova have an applied orientation and ultimately aim to serve the engineering practice and the education of students.

6. Notes and recommendations

- There is a lack of depth in the research. To achieve such depth requires solid knowledge of the problem. For this purpose, the information on the relevant problem should be read in the publications in the journals with an impact factor, publications of Elsevier, Wiley, Taylor

and Francis, SAGE, Springer, MDPI. I have not seen any such article cited by the candidate in his works.

- "Research done" and "experiment conducted" are not in themselves contributions. A contribution can be the result of the research, etc.
- I recommend the candidate to limit the "width" of his appearances in research activity at the expense of significantly greater depth.
- I did not find in the documents a study guide (textbook or manual) written by the applicant. If there really isn't, I recommend filling that gap. For if we imagine that objective truth exists, it will become truth for the subject only if he rediscovers it.

7. Personal impressions

I don't know the candidate personally. I judge by his deeds. I am impressed with the turnout. I hope that one day quantity will grow into quality.

8. Conclusion

Based on all of the above, I propose Tatyana Mitkova Mechkarova, assistant professor, PhD, to take the academic position of "Associate Professor" at the Technical University of Varna, in the field of higher education 5. Technical sciences, in the professional direction 5.1 Mechanical engineering, study discipline Technology of the materials.

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Gabrovo

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