REVIEW

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of the materials submitted for participation in the competition
to occupy an academic position "**Associate Professor**" in:
area of higher education: **5. Technical Sciences**
professional field: **5.6. Materials and Materials Science**
specialty: **"Materials Science and Technology of Machine-Building Materials"**

In the competition for an associate professor, announced in the State Gazette, no. 53 of 09.06.2026 and on the TU-Gabrovo website Mariana Dimitrova Ichkova participates as the only candidate.

I hereby declare in advance that I have co-authored two articles with the candidate, which I will not review.

1. Short CV data

Mariana Dimitrova Ichkova was born in 1974. In 1993, she graduated from the "Vasil Levski" High School of Mechanical Engineering and Technology in Gorna Oryahovitsa, specializing in Mechanical Engineering Technology – Cold Metalworking. In 2001, she graduated from the Technical University of Gabrovo with a Master's degree in Automation, Computer Engineering, and Technologies, specializing in Computer Systems and Technologies. In 2008, she defended her PhD thesis titled "Investigation of the Residual Macro-Stress Field Around Cold-Expanded Holes in Low- and Medium-Carbon Steels" and, in 2009, obtained the PhD degree in the scientific specialty 01.02.02 "Applied Mechanics". From 1997 to 2002, Eng. M. Ichkova worked as the manager of the company ET "Dikom – Mariana Ichkova" in the town of Gorna Oryahovitsa. From 2003 to 2026, she worked at the Technical University of Gabrovo, successively holding the following positions: technical assistant and assistant in the Department of Technical Mechanics, Head of the Technology Transfer Center, and Chief Assistant in the Department of Materials Science and Mechanics of Materials. The candidate possesses independent proficiency in English, fluent command of Russian, and a high level of proficiency in various software products, including CorelDRAW, Adobe applications, and other CAD software.

2. General description of the presented materials

All necessary materials are presented on electronic media. They are in full compliance with the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria (LDASRB), the Rules for its Application and the Rules for the Acquisition of Academic Degrees and the Occupancy of Academic Positions (RAADOAP) at TU-Gabrovo. The candidate has also submitted additional lists of participation in projects, printed textbooks, prepared and delivered lectures on certain disciplines.

According to the report presented, Head Assistant Mariana Dimitrova Ichkova, PhD, Eng., meets and in any cases exceeds the national requirements and those of TU-Gabrovo for the employment of AP "Associate Professor".

2.1. Requirements of LDASRB

- Indicator A – 50 points out of the required 50 points for a dissertation work for awarding PhD degree;
- Indicator B4 – 249 points out of the 100 points required for a habilitation thesis – related scientific publications in international scientific journals with an Impact Factor, indexed in Web of Science;

- Indicator G – 210 points out of the required 200 points, which are subdivided as follows:
  - 30 points for G7 - scientific publication in journals that are referenced and indexed in world-renowned databases with scientific information and
  - 180 points for G8 - scientific publication in non-refereed journals with scientific review or in edited collective volumes.
- Indicator D - 1480 points out of the required 100 points, including:
  - 1480 points for D12 - citations or reviews in scientific publications, referenced and indexed in world-famous databases with scientific information or in monographs and collective volumes.

2.2. Requirements of TU-Gabrovo

- 34 articles presented, of which 4 individual and 15 with IF (WOS) in necessary 15 (4 individual and 1 with IF (WOS));
- Presented 148 citations at 5 required;
- Presented 3 published textbooks with 2 on demand;

3. Overview of the content and results in the presented works

3.1. Indicator B4 – habilitation work – scientific publications (not less than 10) in journals that are referenced and indexed in world-renowned scientific information databases.

The candidate presents 13 related scientific publications equivalent to a monograph, which could be titled "Improving the Surface Properties and Operational Performance of Metal Components via Surface Plastic Deformation Involving Sliding Friction". The subject matter of this work does not duplicate that of the PhD thesis. It is dedicated to the development of theoretical foundations, experimental methodologies, constitutive mathematical models, optimization algorithms, and numerical simulations for the investigation, control, and analysis of surface plastic deformation (SPD) processes involving sliding contact friction, with the aim of purposefully improving the surface integrity (SI), operational performance, and fatigue life of metal construction components. The relevance of the topic is substantiated in the presented review article (B6.1), which develops classification schemes for SPD methods and processes. Subsequent articles develop models of metalworking processes and mechanical systems, as well as models describing the behavior, geometry, and mechanical characteristics of the surface layers of metal components subjected to SPD (B6.2; B6.3; B6.7; B6.8; B6.10). Relationships have been established between the processing parameters and operational characteristics for components made of various alloys - low-carbon and alloy steels, austenitic stainless steels, and copper alloys, treated by SPD (B6.2; B6.4; B6.6; B6.9; B6.11; B6.12). Based on this, effective combined, hybrid, and eco-friendly processes have been developed to enhance the surface properties and operational performance of components (B6.5; B6.13). Equipment for implementing SPD processes has been created, along with a database of optimal process parameters designed to achieve maximum microhardness and compressive residual stresses while minimizing surface roughness.

The analysis demonstrates that **the submitted research papers are equivalent to a monography; they align with the subject matter of the specific field of the procedure and are characterized by contributions of significant scientific-applied and practical value. They have been published in journals with a total impact factor (IF) of 25.953 and have been frequently cited in international journals with an impact factor.** The publications are published in "Metals" (3 papers), "Machines" (2), "Applied Sciences" (2), and "Archives of Materials Science and Engineering" (2), with one paper each in the "International Journal of Advanced Manufacturing Technology", "Journal of the Brazilian Society of Mechanical Sciences and Engineering", "Edelweiss Applied Science and Technology", "Computational Materials Science", and "Journal of Chemical Technology and Metallurgy". One article is single-authored; the candidate is the first author on four, the second author on two, and the third or subsequent author on the remaining papers.

The research topic aligns with the scope of the competition. The studies focus on a highly relevant scientific area: enhancing the operational characteristics of components made from steels and copper alloys - materials widely used in industry - by employing mathematical modeling methods. The results obtained regarding the properties of metal components treated via

SPD, along with the developed effective, eco-friendly processes for improving their surface properties, are of significant scientific and practical interest.

3.2. Indicator G7 - scientific publication in journals that are referenced and indexed in world-renowned databases with scientific information.

This section presents **two articles with a total impact factor of 6.131, published in Q1-ranked journals**: "Computational Materials Science" (1 article) and "Journal of Manufacturing and Materials Processing" (1 article). These studies investigate the strain hardening and creep behavior of an aluminum alloy (G8.1), as well as the potential to enhance surface integrity and high-cycle fatigue resistance through SPD of alloy steel axles and shafts (G8.21).

3.3. Indicator G8 - scientific publication in non-refereed journals with scientific review or in edited collective volumes.

Nineteen articles are presented, published primarily in Bulgarian in the "Journal of Technical University Gabrovo" (2), "Mechanics of Machines" (7), "Mechanical Engineering and Machine Science" (3), "Proceedings of TU-Gabrovo" (3), the "International Journal of Innovative Research and Scientific Studies" (2), and the "UNITECH'04 International Scientific Conference" (1).

They examine the surface properties of austenitic stainless steels treated by diamond burnishing process (G8.17–G8.20); residual stresses and work hardening in cylindrical and non-circular fastener holes after various types of SPD (G8.3–G8.5, G8.12–G8.16); the mechanical characteristics of hot-forging steels (G8.9, G8.12); and processes and tools for various types of surface plastic deformation (G8.2, G8.6–G8.8, G8.10, G8.11).

The content of the publications under indicators G7 and G8 focuses on the investigation via mathematical modeling and experimentation of SPD processes, the characteristics of the surface layer of austenitic stainless steel and aluminum alloy subjected to various SPD methods, and the mechanical properties of hot-stamping steels; this aligns fully with the scope and specialization of the competition. A total impact factor of 6.131 for this group attests to the high scientific and practical value of the research topics and the results obtained.

4. Reflection of the candidate's scientific publications in the scientific field

In this section, the candidate presents a total of 148 citations of their scientific works, all of which appear in journals with an impact factor. A review of the candidate's Web of Science profile shows 19 articles - 12 of which are in the Web of Science Core Collection, along with 170 citations and an h-index of 5. Data from Scopus are as follows: 16 publications, 198 citations, and an h-index of 5. **This indicates widespread recognition and good visibility of the results.**

5. Contributions

In the submitted report, the candidate claims 13 scientific-applied and 2 applied contributions. These contributions are defined precisely, concisely, and clearly, providing a comprehensive overview of the work accomplished to date. It is noteworthy that the majority of the contributions reiterate those associated with indicator B4 (13 related scientific publications equivalent to a monograph). Only 4 scientific-applied contributions stem from the remaining 21 publications. All contributions fall within a single thematic area: the development of equipment and processes for the SPD treatment of metal components using optimal technological parameters to enhance their performance characteristics and durability.

5.1. Scientific-applied contributions

The proposed scientific and applied contributions relate to: 1) the creation of new classifications, methods, approaches, algorithms, designs, models, etc., and 2) the derivation and substantiation of new facts. Therefore, I accept the contributions in this category as formulated.

5.2. Applied contributions – I accept the as defined contributions.

The critical analysis demonstrates a significant number of original scientific-applied and applied contributions. These relate to developed models and actual processes for improving the

surface characteristics, properties, and operational performance of various metallic materials, such as aluminum and copper alloys, as well as low-carbon, alloy, heat-resistant, and stainless steels, processed via various SPD methods. The established databases regarding optimal processing parameters and equipment for the effective implementation of SPD processes offer substantial practical utility.

6. General description of the applicant's activity

6.1. Educational and pedagogical activity

The attached records indicate that **Dr. Eng. Mariana Ichkova** delivers lectures on Technical Mechanics and conducts laboratory and seminar classes for 11 courses, including Materials Science and Technology of Engineering Materials, Computer Methods for Engineering Analysis, and Strength of Materials. Between 2005 and 2026, **she actively participated in maintaining and modernizing the classrooms and computer laboratories used for practical classes** in courses such as Computer Methods for Engineering Analysis and Strength of Materials. Since 2017, M. Ichkova has annually participated in creating and updating tests, as well as organizing, administering, and grading exams for academic competitions and university entrance examinations in general technical subjects. **She also serves as an academic mentor of students for three educational projects.**

The total workload of the applicant according to the references for the last 3 academic years is as follows: 731.1 hours for 2023/2024, 644.1 for 2024/2025 and 615.3 for 2025/2026.

Dr. M. Ichkova is submitting two textbooks and one study book for the competition, thereby meeting the requirements of TU-Gabrovo:

- U.1. Maksimov Y., Duncheva G., Anchev A., Ichkova M., Computer Methods for Engineering Analysis, Book 1: Linear Statics of Beam Structures, Gabrovo, 2014, ExPres;
- U.2. Amudzhev I., Ichkova M., Specialized (Non-standard) Machining Methods and Tools, Gabrovo, 2018, ExPres;
- U.3. Amudzhev I., Duncheva G., Ichkova M., Specialized (Non-standard) Machining Methods and Tools – Syllabus and Test Questions, Gabrovo, 2019, ExPres.

The first textbook presents the fundamentals of the engineering analysis of structural elements using computer-based methods. Nowadays, it is inconceivable to investigate the strength properties of materials without employing the finite element method or other analysis techniques utilizing specialized software. The subsequent textbook and study book form a comprehensive set of educational materials that support instruction in the relevant discipline. I hold all three textbooks in high regard; the information within them is excellently illustrated with photographs and graphics. **Thanks to their synthesized information and supplementary data on materials, these textbooks can serve not only students at the Technical University of Gabrovo but also industry professionals.**

6.2. Scientific and scientific-applied activity

The candidate has participated in 18 university projects and 3 national ones: one under the "Competitiveness of the Bulgarian Economy" Operational Programme, one co-financed by the European Union, and one under the PHARE 2005 programme. It is important to note that **the subject matter of all the projects aligns with the scientific field of the competition.**

The candidate's work merits high praise regarding the PHARE 2005 program project, which M. Ichkova leads, and project BG16RFPR002-1.014-0005 Competence Center "Intelligent Mechatronic, Eco- and Energy-Saving Systems and Technologies" (2025–2029), in which she serves as an R2 researcher in the "Energy-Saving Technologies for Extending Lifecycle and Enhancing Operational Reliability" laboratory.

From 2005 to 2026, Dr. M. Ichkova worked at the Metal Testing Laboratory, where she was responsible for creating a database of test results and client information, issuing test reports, and managing the documentation and archives related to the tests performed. **For the past 10 years, she has served as the technical editor of the scientific journal "Izvestiya" (Proceedings) of the Technical University of Gabrovo.**

7. Evaluation of the candidate's personal contribution

Among the submitted scientific publications, Dr. M. Ichkova is the sole author of four, the first author of ten, the second author of nine, and the third or subsequent author of eleven. It is noteworthy that the articles listed under indicator G8 were published in Bulgarian in Bulgarian scientific journals. The candidate is a member of the author teams for two textbooks and one study book. It is impossible to precisely assess the candidate's specific contribution, as the individual authors' shares are not specified - a standard practice for scientific works produced by a team of authors.

In addition to actively working on numerous projects, the candidate carries out laboratory work commissioned by external clients and serves as a technical editor for a scientific journal - achievements that merit high praise. All of this, combined with the fact that Dr. M. Ichkova is the sole, first, or second author of more than half of the published papers, testifies to her active role in conducting research and training students.

8. Critical remarks and recommendations

Against the backdrop of intensive research and a heavy teaching workload, the candidate's limited participation in conferences both in Bulgaria and abroad, as well as in faculty and student exchange programs (such as Erasmus+), stands out. In this regard, I recommend increasing such participation, as there are numerous results of international significance that could be presented to the broader scientific community.

9. Personal impressions

I do not know the candidate personally.

CONCLUSION

Based on the above, I propose that **Head Assistant Professor Mariana Dimitrova Ichkova**, Ph.D., Eng., **be elected as "Associate Professor"** in the area of higher education **5. Technical Sciences**, professional field: **5.6. Materials and Materials Science,** specialty: **"Materials Science and Technology of Machine-Building Materials"**

14 October 2026
Varna

Reviewer: .....
(Prof. Tsanka Dikova, DSc)