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 Milka Grigorova Atanasova participates as the only candidate.

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

1. Short CV data

Milka Grigorova Atanasova was born in 1977. In 1995, she graduated from the Technical School of Clothing and Catering in the city of Shumen, specializing as a fashion designer and pattern maker for women’s and men’s clothing. In 2000, she graduated from the Technical University of Gabrovo with a Master’s degree in Mechanical Engineering and Technologies. In 2016, she defended her dissertation titled "Technology for the finishing of holes, implementing the spherical burnishing method" and was awarded the PhD degree in the scientific specialty "Mechanical Engineering Technology". From 2001 to 2026, she worked at the Technical University of Gabrovo, holding the successive positions of Assistant, Senior Assistant, and Chief Assistant within the departments of "Materials Science and Materials Technology," "Mechanical Engineering Equipment and Technologies," and "Materials Science and Mechanics of Materials." Dr. Eng. Milka Atanasova possesses an independent skills of English and Russian, a basic skills of German, and a very high level of proficiency in various software products, including SolidWorks, SolidWorks Simulation, LabVIEW, Mathcad, and other CAD tools.

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 Professor Milka Grigorova Atanasova, 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 – 183.76 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 – 211.5 points out of the required 200 points, which are subdivided as follows:
  - 16 points for G7 - scientific publication in journals that are referenced and indexed in world-renowned databases with scientific information and
  - 195.5 points for G8 - scientific publication in non-refereed journals with scientific review or in edited collective volumes.
- Indicator D - 250 points out of the required 100 points, including:
  - 250 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

- 37 articles presented, of which 5 individual, 4 with IF (WOS) and 8 with SJR (Scopus) in necessary 15 (4 individual and 1 with IF (WOS));
- Presented 25 citations at 5 required;
- Presented 2 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 **10 related scientific publications**, equivalent to a habilitation thesis, which could be titled "Applications of Concentrated Energy Fluxes Using a Continuous Electron Beam for Surface Strengthening and Welding of Dissimilar Materials." **The subject matter of this work does not overlap with that of the candidate's doctoral dissertation.** It focuses on the development of appropriate technological parameters for electron-beam welding (EBW) of dissimilar metals and electron-beam surface strengthening (EBSS) of structural steels, aimed at achieving the specific microstructure and properties required for the intended operating conditions. As a result of the research conducted, EBW parameters have been developed for producing high-quality, sound joints between the following materials: copper and AISI 304L austenitic stainless steel (B4.1–B4.3); Ti6Al4V alloy and Al6082-T6 aluminum alloy (B4.4, B4.5, B4.8); carbide-bainitic ductile iron (CADI) and AISI 316L stainless steel (B4.6); AISI 316L stainless steel and 3D-printed Maraging 300 steel (B4.7). Additionally, a new EBST process has been developed for cylindrical components made of structural steel 45, which achieves proven transformation surface hardening (B4.9, B4.10). Relationships have been established between the technological parameters of EBW and EBST processes and the resulting microstructure, hardness, strength properties, and surface integrity for all groups of materials investigated. The influence of the electron beam position on the formation of the microstructure within the weld zone during the EBW of dissimilar metals has been demonstrated, as has the positive effect of a magnetron-sputtered copper layer on the strength properties of Ti6Al4V/Al6082-T6 alloy joints produced via EBW.

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 of 12.4 and SJR=0.819 and have been cited in international journals in Web of Science and Scopus.** The publications consist of: 2 in "Metals", 2 in "Journal of Physics: Conference Series", 2 in "Environment Technology Resources – Proceedings of the 16th International Scientific and Practical Conference", 1 in "Bulgarian Chemical Communications", 1 in "Crystals", 1 in "Journal of Manufacturing and Materials Processing", and 1 in "Archives of Materials Science and Engineering". The distribution of the articles by journal quartile is as follows: Q1 – 1 article, Q2 – 3 articles, Q3 – 3 articles, and Q4 – 1 article. Two of the articles are single-authored; for one article, the candidate is the first author; for one, the third author; and for the remaining articles, the candidate is a subsequent author.

The research focus aligns with the scope of the competition. The studies fall within a contemporary scientific field that offers significant potential for application: the processing of

metal alloys using concentrated energy fluxes - specifically through electron-beam welding and electron-beam surface strengthening. The data obtained regarding the influence of process parameters on the structure and properties of the materials used (copper, structural and special steels, austenitic stainless steels, aluminum and titanium alloys, and carbide-bainitic spheroidal graphite cast iron) provide a solid foundation for developing new EBW processes for dissimilar metals, as well as techniques for hardening the surface layers of structural steels via EBSS. The newly developed EBW and EBSS regimes are highly significant - not only from a scientific perspective but also as innovative technologies ready for implementation in industrial production.

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

This section presents **2 articles with a total SJR of 0.59, published in Q3-quartile journals**: "Biointerface Research in Applied Chemistry" (1 article) and "Engineering Proceedings" (1 article). These articles examine the addition of a plasticizer to PVC (G7.1) and the restoration of the working surfaces of mold inserts used in the injection molding of non-ferrous metals, employing laser technologies (G7.2).

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

A total of 25 articles are presented, 19 of which were published in conference proceedings: 17 in Bulgaria and 2 in the proceedings of international conferences abroad (one each in Serbia and Turkey). The remaining articles were published in journals: "Journal of Technical University Gabrovo" (4 articles), "International Journal of Innovative Research and Scientific Studies" (1 article), and "Innovation in Woodworking Industry and Engineering Design" (1 article).

These sections examine processes and equipment for hydrostatic plastic deformation, hydromechanical deep drawing, and combined hydromechanical forming of thin-walled parts (G8.1–G8.12); the mechanical characteristics and wear resistance of carbide-bainitic cast irons (G8.13–G8.15); the application of co-plasticizers and biodegradable additives in plastics (G8.16–G8.18); the microstructure and microhardness of titanium alloy and structural steel 45 surface, strengthened via electron-beam surface treatment (G8.20–G8.22); and the structure and mechanical properties of joints between dissimilar alloys - specifically Cu/Al 6082T6 welded via electron-beam welding, as well as joints involving carbide-bainitic ductile cast iron and AISI 316L stainless steel (G8.24–G8.25).

The content of the publications under indicators G7 and G8 concerns the investigation of plastic deformation processes, the properties of plastics and carbide-bainitic cast irons, the structure and mechanical properties of titanium alloy and Steel 45 following electron-beam surface strengthening, as well as joints between dissimilar alloys welded via electron-beam welding - all of which is fully consistent with the field and specialization of the competition. The research in this group is aimed at addressing significant industrial production challenges through the application of scientific approaches and modern technologies.

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

In this section, the candidate presents a total of 25 citations of their scientific work, all of which appear in journals indexed in Scopus or Web of Science. A review of the candidate's Web of Science profile shows 7 articles, 26 citations, and an h-index of 4. The data in Scopus are as follows: 12 publications, 36 citations, and an h-index of 3. **This indicates a relatively good visibility of the results.**

5. Contributions

In the submitted report, the candidate claims 21 scientific-applied contributions and 13 applied contributions across 6 thematic areas. It is appropriate for these contributions to be classified according to their respective areas. When formulating the contributions, it should be noted that they ought to represent a synthesis and generalization of the conclusions drawn in the publications. Given the 35 publications presented, the ratio of publications to contributions is nearly 1:1, which implies that the conclusions from the publications have been used almost directly. Consequently, I do not accept the

contributions as formulated by the candidate. My assessment of the candidate's contributions has been conducted in light of these considerations.

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.

1. New data have been established regarding the microstructure and mechanical properties of welded joints between dissimilar alloys (titanium alloy Ti6Al4V and aluminum alloy Al6082-T6; carbide-bainitic spheroidal graphite cast iron and AISI 316L stainless steel; AISI 316L stainless steel and 3D-printed Maraging 300 steel; copper and aluminum alloy Al6082-T6), produced via electron beam welding.
2. Relationships have been established between the technological parameters of the EBW and EBSS processes and the resulting microstructure, hardness, strength properties, and surface integrity for all groups of investigated materials.
3. The influence of the electron beam position on the microstructure formation within the weld zone during electron beam welding of dissimilar metals has been demonstrated, as has the positive effect of a magnetron-sputtered copper layer on the strength properties of EBW-produced joints between Ti6Al4V and Al6082-T6 alloys.
4. The microstructure and phase composition of the surface of forming inserts for dies made of 1.2343 steel, processed via laser cladding followed by nitriding, have been determined.
5. An algorithm has been developed for the theoretical determination of the type of stress and strain state during hydrostatic bulging with axial loading, which has been experimentally verified.
6. Deformation parameters have been determined for the hydromechanical deep drawing and radial contraction of blanks made from thin-sheet steels (DC01 and DC03) and non-ferrous alloys (Cu-Zn37, Al99.5).
7. Mechanisms for carbide formation and the stability of the austenitic matrix in austenitic manganese steel have been established as a function of the cooling rate.
8. The optimal amount of carbide phase and the isothermal quenching temperature for carbide-bainitic cast irons (CADI) have been determined to achieve maximum wear resistance and mechanical properties.

In this category, I do not accept the penultimate contribution regarding the “confirmed effectiveness of the combined application of scanning electron microscopy and X-ray diffractometry for the comprehensive analysis of phase transformations, surface topography, and the investigation of microdefects,” because this is a conventional research methodology that has been in use for many years.

5.2. Applied contributions

1. EBW regimes have been developed for producing high-quality monolithic joints for all groups of metals and alloys specified in the scientific-applied contribution 1.
2. A new process for EBSS of cylindrical components made of structural steel 45 has also been developed, featuring proven transformation-based surface strengthening.
3. A technology has been developed involving laser cladding followed by nitriding for the restoration of worn working surfaces on the molding elements of molds used for the die casting of non-ferrous metals.
4. A method for the ultrasonic synthesis of carbohydrate and aliphatic esters has been developed, and their plasticizing effect as bio-based additives in PVC has been demonstrated.
5. A wide range of test rigs, modules, tools, and equipment for plastic deformation processes, such as stamping, hydrostatic forming, and hydromechanical deep drawing, has been designed and manufactured.

The critical analysis demonstrates a significant number of original scientific-applied and applied contributions. These relate to established relationships between technological parameters, microstructure, and properties of: 1) joints between dissimilar metals produced via electron-beam welding; 2) titanium alloy and structural steel subjected to surface treatment via electron-beam surface strengthening; and 3) carbide-bainitic cast irons, austenitic manganese steel, and heat-resistant steel following thermal or combined treatment (laser cladding and nitriding). The developed processes and parameters for electron-beam surface processing and welding, the technology for restoring die inserts used in pressure die casting, the tool equipment for plastic deformation, and the method for the ultrasonic synthesis of carbohydrate and aliphatic esters hold substantial practical application.

6. General description of the applicant's activity

6.1. Educational and pedagogical activity

The provided documentation indicates that Chief Assistant Professor Dr. Eng. Milka Atanasova delivers lectures to bachelor's and master's degree students in the professional fields of 5.6 Materials and Materials Science, 5.1 Mechanical Engineering, and 5.13 General Engineering, across both full-time and part-time study programs. She gives lectures on 9 subjects, including Materials Science and Technology of Engineering Materials, Manufacturing Technology for Workpieces, Plastic Deformation Processing of Materials, and Welding of Materials, among others. Additionally, she conducts laboratory classes and project work for 10 subjects. **Under her supervision, 21 students have completed their diploma theses. Dr. M. Atanasova serves as the coordinator for Bachelor's degree students in the major "Materials Technology and Materials Science"** (covering years 1 through 4, in both full-time and part-time modes of study). From 2019 to 2026, she has been responsible for the Master's degree program in "Materials Technology and Materials Science" (full-time and part-time) within the professional field of "Materials and Materials Science" (Field 5.6). Additionally, since 2023, she has been in charge of the Master's program in "Surface Engineering" (full-time mode of study) within the same professional field.

She regularly participates in the preparation of accreditation documentation for the professional field 5.6 "Materials and Materials Science," as well as in the maintenance of hydraulic and eccentric presses in the "Metal Forming" laboratory. **She has completed four international mobility assignments under the Erasmus+ program** and one under project No. BG05M20P001-2.016-0008, "Innovation, Science and Education for High Quality and Labor Market Relevance at the Technical University of Sofia and Partners" (INNOTECH PRO).

The candidate's total workload, according to the records for the last three academic years, is as follows: 1,028.28 hours for 2023/2024, 838.30 hours for 2024/2025, and 1,242.70 hours for 2025/2026.

Dr. M. Atanasova has submitted two textbooks for the competition, thereby meeting the requirements of the Technical University of Gabrovo:

U.1. Amudzhev, I., M. Atanasova. "Planning the Layout of Production". Gabrovo: Ex-press, 2019. 91 pp. ISBN 978-954-490-646-7

U.2. Atanasova, M. "Technologies for Manufacturing Workpieces. Part I: Production of Castings". Gabrovo: "Vasil Aprilov" University Press, 2026. ISBN 978-954-683-745-5.

The first textbook was created to support the instruction of students in the discipline of "Planning the Layout of Production Facilities." The second textbook provides a detailed examination of the theoretical foundations of foundry production, the design of castings, materials, and foundry molds, as well as the primary defects that can occur in castings. Significant attention is devoted to the technological characteristics and capabilities of various casting methods, as well as to modern trends in the development of the foundry industry. I hold both textbooks in high regard. The information they contain is very well illustrated with photographs and graphical material. **Given the synthesized information and the supplementary data on materials, these textbooks can serve not only students at the Technical University of Gabrovo but also engineers and managers working in the industrial sector.**

6.2. Scientific and scientific-applied activity

The candidate has participated in 17 university projects, 2 educational projects, and 5 national projects - 2 under the Operational Programme "Science and Education for Smart Growth," 2 under the Operational Programme "Innovation and Competitiveness," and 1 under the Operational Programme "Research, Innovation and Digitalization for Smart Transformation." It is important to note that **the subject matter of all these projects aligns with the scientific field of the competition.** The candidate's work on project BG16RFPR002-1.014-0005, the Competence Centre for "Intelligent Mechatronic, Eco-friendly, and Energy-saving Systems and Technologies," deserves high evaluation.

7. Evaluation of the candidate's personal contribution

Among the submitted scientific publications, Dr. M. Atanasova is the sole author of 5 articles and 1 textbook; she is the first author of 2 articles, the second author of 3 publications, the third author of 19 publications, and a co-author (in a subsequent position) of 8 articles. It is noteworthy that the majority of the articles under indicator G8 were published in Bulgarian scientific journals (5 articles) or in conference proceedings from Bulgaria (17 articles). Only 2 articles were published in conference proceedings abroad (in Serbia and Turkey), and 1 in an international scientific journal abroad. **The candidate is the sole author of one of the textbooks and the second author of the other.**

The participation of Dr. M. Atanasova in more than half of the articles as sole, first, or co-author (up to the third position), the publication of a sole-authored textbook, her involvement in numerous university projects as well as five national-level projects, and her successful supervision of students' thesis work, all clearly attest to her active role in conducting research and educating students.

8. Critical remarks and recommendations

I have no critical remarks regarding the candidate. I do, however, have a recommendation concerning the presentation of contributions. In procedures of this level, the conclusions of individual articles should not automatically be listed as contributions. Instead, the essence of the results obtained, derived from the conclusions, should be summarized and synthesized, and then grouped according to the relevant thematic areas.

9. Personal impressions

I do not know the candidate personally.

CONCLUSION

Based on the above, I propose that **Head Assistant Professor Milka Grigorova Atanasova**, 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".**

20 October 2026 **Reviewer**: .....

Varna (Prof. Tsanka Dikova, DSc)