OPINION

on the competition for the academic position of Associate Professor

in Scientific Field 5: Technical Sciences

Professional Field 5.6: Materials and Materials Science, and specialty “Materials Science and Technology of Engineering Materials”, announced in State Gazette No. 53 of 9 June 2026,

with the admitted candidate: Chief Assistant Professor Eng. Milka Grigorova Atanasova, PhD.

Member of the Scientific Jury: Assoc. Prof. Yaroslav Borisov Argirov, PhD, Eng.

pursuant to Order No. 3-01-426/18 September 2026 of the Rector of the Technical University of Gabrovo

1. General overview of the candidate’s research and applied research activities

Chief Assistant Professor Milka Grigorova Atanasova, PhD, Eng., completed her secondary education in 1995 at the Technical School of Clothing and Catering in Shumen. She obtained her Master’s degree from the Technical University of Gabrovo, specialty “Materials Science and Engineering”, in 2000. In 2016, she defended her doctoral dissertation entitled “Technology for the Finishing of Holes Produced by the Spherical Burnishing Method”. Her professional career has been associated with teaching at the Technical University of Gabrovo, in the Department of Materials Science and Materials Technology. In 2001, she was appointed Assistant in the Department of Mechanical Engineering and Materials Technology, and in 2012 she was promoted to Chief Assistant Professor at the Technical University of Gabrovo, a position she continues to hold.

The following works have been submitted for participation in the competition for Associate Professor:

Under indicator A.1: doctoral dissertation entitled “Technology for the Finishing of Holes Produced by the Spherical Burnishing Method”.

1.1. Under indicator B.4: habilitation work — scientific publications in journals indexed and abstracted in internationally recognised scientific databases, 10 publications.

1.2. Under indicator G.7: 2 scientific publications indexed and abstracted in internationally recognised scientific databases (both indexed in Scopus).

1.3. Under indicator G.8: 25 scientific publications in peer-reviewed journals not indexed in such databases or in edited collective volumes; 3 are sole-authored and the candidate is first author of one.

1.4. Under indicator D.12: 16 citations in publications have been submitted, excluding self-citations; one scientific publication has received 8 citations and is associated with an impact factor (Scopus Q2).

1.5. Under indicator E.23 (listed as indicator U in the list of scientific works): 2 textbooks have been published, in accordance with the minimum requirements of the Technical University of Gabrovo for the academic position of Associate Professor.

For evaluation, I accept the submitted scientific publications equivalent to a monograph entitled “Applications of Concentrated Energy Fluxes with a Continuous Electron Beam for Surface Hardening and Welding of Dissimilar Materials”, comprising 10 works, in which the candidate’s contributions are as follows:

• First author of 3 works.

• Third or subsequent author of 7 works.

All publications are relevant to the subject of the competition and are written in English.

The candidate, Chief Assistant Professor Milka Grigorova Atanasova, PhD, Eng., has participated in 23 international and 4 national scientific conferences.

She has participated in 5 national research projects funded through operational programmes: “Science and Education for Smart Growth”, “Innovation and Competitiveness”, and “Research, Innovation and Digitalisation for Smart Transformation”.

Educational projects: 2.

Research projects specifically funded by the state budget at the Technical University of Gabrovo: 15.

A substantial proportion of these research projects is related to the candidate’s professional field.

Conclusion: Chief Assistant Professor Milka Grigorova Atanasova, PhD, Eng., meets all procedural requirements under the Development of Academic Staff in the Republic of Bulgaria Act, its implementing regulations, and the Regulations on the Conditions and Procedure for Acquiring Academic Degrees and Holding Academic Positions at the Technical University of Gabrovo, as required for appointment to the academic position of Associate Professor. Some requirements have been exceeded, particularly in group U.

2. Assessment of the candidate’s pedagogical training and teaching activities

Chief Assistant Professor Milka Grigorova Atanasova, PhD, Eng., delivers lectures and practical classes to Bachelor’s degree students at the Technical University of Gabrovo in Professional Field 5.6, “Materials and Materials Science”, in the following courses:

2.1.1. Technology of Blank Production — lectures and practical classes;

2.1.2. Materials Processing by Plastic Deformation — lectures and practical classes;

2.1.3. Punching Technology and Tooling — lectures and practical classes;

2.1.4. Welding of Materials — lectures and practical classes;

2.1.5. Technical Safety — practical classes;

2.1.6. Casting of Materials — project;

2.1.7. Materials Processing by Plastic Deformation — project.

She also delivers lectures and practical classes to Bachelor’s degree students at the Technical University of Gabrovo in Professional Fields 5.1, “Mechanical Engineering”, and 5.13, “General Engineering”, in the following courses:

2.2.1. Materials Science and Technology of Engineering Materials — lectures and practical classes;

2.2.2. Materials Science and Materials Technology — lectures and practical classes;

2.2.3. Safety Engineering — practical classes.

She delivers lectures and laboratory classes to Master’s degree students at the Technical University of Gabrovo in Professional Field 5.6, “Materials and Materials Science”, in the following courses:

2.3.1. Composite Materials — lectures and practical classes;

2.3.2. Welding — lectures and practical classes;

2.3.3. Materials Processing by Plastic Deformation — lectures and practical classes.

She also delivers lectures and practical classes to Master’s degree students at the Technical University of Gabrovo in Professional Fields 5.1, “Mechanical Engineering”, and 5.13, “General Engineering”, in the following courses:

2.4.1. Materials Science and Technology of Engineering Materials — lectures and practical classes;

2.4.2. Resource-Efficient Technologies — lectures and practical classes;

2.4.3. Technological Processes and Equipment — lectures and practical classes.

During the 2023–2024 academic year, the candidate supervised 11 students who successfully defended their graduation projects; during 2025–2026, she supervised 10 students who successfully defended theirs.

With regard to the maintenance and modernisation of the facilities and equipment used in the laboratories at the Technical University of Gabrovo, Chief Assistant Professor Milka Grigorova Atanasova, PhD, Eng., has participated in:

• Design and manufacture of a rig for hydrostatic plastic forming of components open at both ends.

• Design and manufacture of coining dies for upsetting operations.

• Design and manufacture of dies for shearing operations.

• Design and manufacture of pattern and core-box equipment for producing complex castings.

• Maintenance of hydraulic and eccentric presses in the laboratories for “Metal Forming by Plastic Deformation”.

Conclusion: I assess the candidate’s pedagogical qualifications as being at a very high level for the academic position of Associate Professor.

3.1. Principal scientific and applied-scientific contributions

The contributions presented in the candidate’s 10 scientific works can be classified into the following thematic areas:

A. Development of new classifications, methods, approaches, algorithms, designs and models

3.1.1. “A new process for electron-beam surface treatment of cylindrical components has been developed, demonstrating transformation hardening of a medium-carbon structural steel surface. The process is characterised by linear scanning in the axial direction, which eliminates thermal-overlap effects along the axis.” Habilitation work (B.4, B10).

3.1.2. “Electron-beam welding processes have been developed that enable sound, monolithic joints without cracks or defects in the following dissimilar-material combinations: copper and AISI 304L stainless steel (B.4.1–B.4.3); carbide-austempered ductile iron (CADI) and AISI 316L stainless steel (B.4.6); AISI 316L stainless steel and additively manufactured Maraging 300 steel (B.4.7); and Ti-6Al-4V titanium alloy and Al6082-T6 aluminium alloy (B.4.4, B.4.5, B.4.8).”

B. Obtaining and substantiating new findings

3.1.3. “It was established that, for all investigated electron-beam welding (EBW) parameters for joints between electrolytic copper and AISI 304 austenitic chromium-nickel stainless steel, the weld zone consists of a substitutional solid solution of Cu and γ-Fe and a metastable α-Fe phase.” (B.4.1–B.4.3).

3.1.4. “A correlation was established between increased beam power, activation of convection, changes in cooling rate, and grain growth during EBW of electrolytic copper and AISI 304 austenitic chromium-nickel stainless steel.” (B.4.1–B.4.3).

3.1.5. “It was demonstrated that, during EBW of Ti-6Al-4V and Al6082-T6 alloys, beam positioning determines the interaction mechanism: when directed towards the aluminium alloy, the interaction is liquid–solid, suppressing intermetallic phases; with no offset or with the beam directed towards the titanium alloy, the interaction is liquid–liquid, producing a heterogeneous and brittle zone.” (B.4.4).

3.1.6. “It was demonstrated that the phase composition of the weld zone depends directly on beam positioning: offsetting the beam towards the aluminium alloy produces a minimal $TiAl_3$ intermetallic layer, whereas offsetting it towards the titanium alloy or using beam oscillation promotes the formation of a wider range of brittle intermetallic compounds.” (B.4.4, B.4.5).

3.1.7. “It was established that circular beam oscillation during EBW of Ti-6Al-4V and Al6082-T6 alloys increases the lifetime of the molten pool and the volume of molten material, thereby promoting the formation of non-equilibrium and metastable phases.” (B.4.5).

3.1.8. “It was established that, during EBW of Ti-6Al-4V and Al6082-T6 alloys without a magnetron-sputtered copper interlayer, the fusion zone develops a pronounced preferred texture of the aluminium solid solution associated with the (111) crystallographic plane family. Applying a thin copper interlayer approximately 10 μm thick redistributes the microvolumes and reorients the texture towards the less densely packed crystallographic planes (110), (100) and (311).” (B.4.8).

3.1.9. “It was demonstrated that the presence of a magnetron-sputtered copper interlayer increases the ratio of ultimate tensile strength to yield strength from 1.03 without the copper interlayer to 1.44 with the interlayer.” (B.4.8).

3.1.10. “It was demonstrated that electron-beam surface hardening (EBSH) of grade 45 steel produces a modified, graded surface layer consisting of a fully transformed surface zone (acicular martensite, retained austenite and pseudo-amorphous regions), a transition zone with partial transformation, and a core retaining its original ferrite-pearlite structure.” (B.4.9, B.4.10).

3.2. Applied contributions

3.2.1. “It was demonstrated that EBW without beam offset (0 mm offset) between electrolytic copper and AISI 304 austenitic chromium-nickel stainless steel provides the best balance of strength properties.” [B.4.1–B.4.3].

3.2.2. “It was demonstrated that positioning the beam towards the aluminium alloy during EBW of Ti-6Al-4V and Al6082-T6 alloys prevents excessive increases in weld microhardness, whereas beam oscillation leads to hardening and the formation of a martensitic structure in the heat-affected zone on the titanium-alloy side.” [B.4.4, B.4.5].

3.2.3. “It was demonstrated that preheating AISI 316L austenitic stainless steel and CADI cast iron to 340 °C is essential for producing an EBW joint without visible defects or macrocracks.” [B.4.6].

3.2.4. “To compensate for differences in the thermophysical properties of the materials being welded (AISI 316L steel and CADI cast iron), the beam must be offset towards the austenitic steel.” [B.4.6].

3.2.5. “To improve surface roughness in electron-beam surface hardening of cylindrical C45 steel components relative to a turned surface, high axial linear-scanning frequencies (up to 20,000 Hz) and an optimised thermal regime are required.” [B.4.9, B.4.10].

3.2.6. “The applicability of EBSH as an effective technology for transformation hardening of cylindrical C45 steel components has been demonstrated. The process combines high surface hardness and compressive residual stresses with retention of core toughness in the specimens.” [B.4.9, B.4.10].

The contributions contained in the candidate’s works can be classified into the following groups:

• Applied-scientific contributions: 10 thematic areas, each represented in the habilitation work.

• Applied contributions: 6 thematic areas.

As demonstrated above, the candidate has made significant applied-scientific and applied contributions, some of which are her own work or were achieved with her decisive involvement. The habilitation work is based on 10 articles indexed in internationally recognised scientific databases. Citations of these works indicate recognition of the candidate by the scientific community.

4. Significance of the contributions to science and practice

The substantial number of scientific, applied-scientific and applied contributions enriches theory, teaching materials and practice in the field covered by the competition. The candidate, Chief Assistant Professor Milka Grigorova Atanasova, PhD, Eng., has submitted 25 works published in peer-reviewed journals, two of which are indexed in the internationally recognised databases Scopus and Web of Science. This demonstrates that the candidate operates at a high scientific and technical level. The candidate has submitted a habilitation work based on 10 scientific publications, equivalent to a monograph, entitled "Applications of Concentrated Energy Fluxes with a Continuous Electron Beam for Surface Hardening and Welding of Dissimilar Materials", indexed in internationally recognised databases, including Scopus.

A total of 16 citations of the candidate's works have been submitted. One article has been cited 8 times, demonstrating the candidate's recognition among scientific communities in Bulgaria and abroad.

The quantitative indicators required for appointment to the academic position of Associate Professor have been met. Two textbooks have been published in excess of the requirements, one of which is sole-authored by the candidate.

In my assessment, Chief Assistant Professor Milka Grigorova Atanasova, PhD, Eng., has established herself as a highly qualified specialist and a recognised researcher and educator in materials science and heat treatment of materials, both nationally and internationally.

5. Critical remarks and recommendations

I have no critical remarks concerning the candidate's scientific works or professional activities. The candidate exceeds the requirements for appointment to the academic position of Associate Professor.

CONCLUSION

Although I do not know the candidate personally, on the basis of the submitted documents, materials and scientific works, their significance, and the applied-scientific and applied contributions they contain, I consider that Chief Assistant Professor Milka Grigorova Atanasova, PhD, Eng., fully meets the requirements of the Development of Academic Staff in the Republic of Bulgaria Act, its implementing regulations, and the Regulations of the Technical University of Gabrovo governing the development of academic staff for appointment to the academic position of Associate Professor. I therefore give my positive assessment and recommend that the esteemed Scientific Jury support the candidacy of Chief Assistant Professor Milka Grigorova Atanasova, PhD, Eng., for the academic position of Associate Professor in Higher Education Area 5, Technical Sciences, Professional Field 5.6, Materials and Materials Science, specialty "Materials Science and Technology of Engineering Materials".

1 November 2026 Member of the Scientific Jury:

Varna /Assoc. Prof. Y. Argirov, PhD, Eng./