**OPINION**

by Prof. Stoyko Atanasov Gyurov,

"Acad. Angel Balevski" Institute of Metal Science, Equipment and Technologies with Centre for Hydro- and Aerodynamics – BAS, member of the scientific jury, regarding the materials submitted for the competition for the academic position of "Associate Professor" in Higher Education Area 5: Technical Sciences, Professional Field 5.6: Materials and Materials Science, Specialization: Materials Science and Technology of Engineering Materials.

For the competition for the position of Associate Professor—announced in the State Gazette, Issue No. 53 of June 9, 2026, to meet the needs of the Department of Mechanical Engineering, Computer Systems, and Electrical Engineering at the Technical College of Lovech—the sole candidate to apply was Chief Assistant Professor Mariana Dimitrova Ichkova, PhD (Eng.).

**1. Overview of the content and results of the submitted works**

The documents submitted by Chief Assistant Professor Mariana Dimitrova Ichkova, PhD (Eng.) for the competition for the academic position of "Associate Professor" comply with the requirements of the Act on the Development of the Academic Staff in the Republic of Bulgaria (ZRASRB), the Regulations for its implementation, and the Regulations on Acquiring Academic Degrees and Holding Academic Positions at the Technical University of Gabrovo.

The materials include: Indicator A – Abstract of the dissertation for the award of the educational and scientific degree of "Doctor" on the topic: "Investigation of the residual macro-stress field around cold-expanded holes in low- and medium-carbon steels," Technical University – Gabrovo, 2008 – earning 50 points (requirement: 50). Indicator B – Habilitation thesis – a collection of related scientific publications in international journals with an Impact Factor, indexed in Web of Science, on the topic: "Improvement of surface properties and operational performance of metal components via surface plastic deformation (SPD) involving sliding friction contact" – publications 6.1 through 6.13 from the publication list – totalling 249 points (requirement: 100). **Indicator G:** "Scientific publications in journals refereed and indexed in world-renowned scientific databases" – publications G.8.1 and G.8.21; and "Scientific publications in non-refereed journals with peer review or in edited collective volumes" – items G.8.2 through G.8.20. Total for Indicator G: 210 points (requirement: 200). Indicator D: "Citations or reviews in scientific publications refereed and indexed in world-renowned scientific databases, or in monographs and collective volumes" – 148 citations, yielding 1,480 points (requirement: 50). Published textbooks and teaching aids: 3 (requirement: 2).

The quantitative criteria for the academic position of "Associate Professor," in accordance with the Regulations for Acquiring Academic Degrees and Holding Academic Positions at Technical University – Gabrovo, have been met.

The results of the research work conducted by Chief Assistant Professor Mariana Dimitrova Ichkova, PhD (Eng.) can be summarized into three main groups, as follows:

1. Improvement of surface properties and operational performance of metal components through surface plastic deformation (SPD) – research papers: [B.4.1 – B.4.13, G.8.6, G.8.14, G.8.15, G.8.17, G.8.18, G.8.19, G.8.20, G.8.21];
2. Technological methods for enhancing the fatigue life of structural elements with fastener holes – research papers: [G.8.2, G.8.3, G.8.4, G.8.5, G.8.10, G.8.13, G.8.16];
3. Experimental and simulation-based investigation of the mechanical characteristics and behavior of metals and alloys – research papers: [G.8.1, G.8.7, G.8.8, G.8.9, G.8.11, G.8.12].

The habilitation thesis develops theoretical foundations, experimental methodologies, constitutive mathematical models, optimization algorithms, and numerical simulations for the investigation, control, and analysis of SPD processes involving sliding friction contact, with the aim of purposefully improving surface integrity (SI), operational performance, and fatigue life of metal structural elements.

The following tasks were being solved:

• Development of a classification model for systematizing methods for surface plastic deformation involving sliding friction contact – [B.6.1]; – [B.6.1];

• Obtaining original data on the physical and thermomechanical phenomena in the contact zone during surface plastic deformation (SPD) involving sliding friction, and defining analytical and numerical models for the process's energy and force parameters – [B.6.2 – B.6.13];
• Appropriate constitutive models have been developed for material hardening in the surface layers of components processed via SPD (Surface Plastic Deformation) – [B.6.2];
• Realistic finite element method (FEM) models of SPD processes have been developed, accounting for non-linear kinematic material hardening and elastoplastic wave effects, alongside the validation of FE simulation results through parallel physical experiments – [B.6.2];
• An experimental analysis was conducted on the influence of processing parameters on the microstructure, microhardness, roughness, and phase composition of steels and non-ferrous alloys – [B.6.2 – B.6.13];
• Optimization of processing parameters to enhance the fatigue life and durability of structural components treated using the methods under consideration – [B.6.3 – B.6.13];
• Ecologically sustainable combined processing methods have been scientifically substantiated and researched – [B.6.5 – B.6.13].
The comprehensive interpretation of the obtained experimental results enables the candidate to establish correlations between the processing parameters, the resulting microstructure, the phase composition, the obtained structural integrity characteristics, and the tribological and fatigue behavior of metallic structural elements.
The works of Chief Assistant Professor Mariana Dimitrova Ichkova, PhD (Eng.), and the results obtained therein, lead me to conclude that the candidate is a highly capable researcher with a marked affinity for physical metallurgy and the heat treatment of metals.

**2. General overview of the candidate's activities**

**2.1. Teaching and pedagogical activities (work with students and doctoral candidates)**

Chief Assistant Professor Mariana Dimitrova Ichkova, PhD (Eng.), is participating in the competition as a co-author of two textbooks and one study aid, as follows: 1. Maksimov Y., Duncheva G., Anchev A., Ichkova M., „Computer Methods for Engineering Analysis, Book 1: Linear Statics of Beam Structures“, Gabrovo, 2014, ExPres; 2. Amudzhev I., Ichkova M., „Specialized (Non-standard) Machining Methods and Tools“, Gabrovo, 2018, ExPres; 3. Amudzhev I., Duncheva G., Ichkova M., „Specialized (Non-standard) Machining Methods and Tools – Syllabus and Test Questions“, Gabrovo, 2019, ExPres.
The candidate delivers lectures on Technical Mechanics and conducts laboratory and seminar exercises for 11 (eleven) courses: Materials Science and Technology of Engineering Materials; Computer Methods for Engineering Analysis; Resistance of Materials; Strength of Materials; Applied Mechanics; Mechanics I; Mechanics II; Mechanics; Technical Mechanics; Theoretical Mechanics; and Kinetics of Bodies.
The "Other Contributions" section indicates that Chief Assistant Professor Mariana Dimitrova Ichkova, PhD (Eng.) is involved in the maintenance and modernization of classrooms and computer laboratories used for practical exercises, as well as activities related to the Metal Testing Laboratory. She has served for many years as the technical editor for the scientific journal „Izvestiya“ (Proceedings) of the Technical University of Gabrovo and actively participates in the university's student recruitment campaigns.
Based on the foregoing, I am firmly convinced that Chief Assistant Professor Mariana Dimitrova Ichkova, PhD (Eng.) possesses the necessary pedagogical training and qualifications to hold the academic position of Associate Professor at the Technical University of Gabrovo.

**2.2. Scientific and applied research activity**

The candidate has been lead one national research project and has participate as a researcher in two other projects. Chief Assistant Professor Mariana Dimitrova Ichkova, PhD (Eng.) has participate in 12 (twelve) university projects and three (three) educational projects.

**2.3. Implementation activities**

No data available.

**3. Contributions (scientific, scientific-applied, applied).**

I accept the candidate's contributions with minor editing.

**Scientific and applied contributions**

1. Finite element models of metalworking processes and mechanical systems have been developed [B.6.2, Г.8.1, Г.8.2, Г.8.3, Г.8.4, Г.8.5, Г.8.6, Г.8.8, Г.8.10, Г.8.11, Г.8.13, Г.8.14, Г.8.15, Г.8.17];
2. Effective combined, hybrid, and eco-friendly processes have been developed to improve the surface properties and operational performance of metal components [B.6.5, B.6.13];
3. Correlations between "finishing – surface properties – operational performance" have been established for surface plastic deformation (SPD) [B.6.2, B.6.4, B.6.12, Г.8.21];
4. Classification schemes for SPD methods and processes have been developed [B.6.1];
5. Mathematical models describing the geometric and mechanical characteristics of the surface layer of metal components processed via SPD have been developed [B.6.3, B.6.7, B.6.8, B.6.10, Г.8.16, Г.8.18, Г.8.19, Г.8.20, Г.8.21];
6. Constitutive models have been developed for the material behavior of the surface layers of metal components subjected to SPD processing [B.6.2];
7. The correlation between manufacturing history and the capability of the SPD process to improve the surface properties and operational performance of metal components has been established [B.6.6, B.6.11];
8. The correlation between processing parameters and strain-induced α'-martensite formation during the SPD of chromium-nickel austenitic steels has been established [B.6.9];
9. Mathematical models have been developed for the strain hardening and creep behavior of the material surrounding cold-expanded holes in non-ferrous alloys [G.8.1, G.8.10, G.8.16];
10. Mathematical models of the energy-force characteristics of surface plastic deformation (SPD) processes have been developed [G.8.6, G.8.10];
11. The energy balance within the "deforming element – work piece surface" thermodynamic system during the SPD process, involving sliding contact friction, has been investigated [B.6.2];
12. Mathematical models of the strain hardening of tough-ductile alloys have been developed [G.8.1, G.8.7];
13. Models of the mechanical properties of die steels have been developed [G.8.9, G.8.12].

**Practical contributions**

1. A database of optimal values for the control factors of the SPD (Surface Plastic Deformation) process has been created, ensuring minimum roughness, maximum microhardness, and compressive residual stresses [B.6.2, B.6.3, B.6.4, B.6.5, B.6.6, B.6.7, B.6.8, B.6.9, B.6.10, B.6.11, B.6.12, B.6.13, Г.8.15, Г.8.18, Г.8.19, Г.8.20, Г.8.21];
2. Technological tooling has been developed for the implementation of SPD processes [B.6.3, B.6.6, B.6.10, B.6.13, Г.8.14, Г.8.18, Г.8.19, Г.8.20, Г.8.21].

**Significance of the contributions to science and practice**

The candidate's research work is applied focus and ultimately aims to serve engineering practice and student education. The significant number of citations (148) attests to the importance of the candidate's work.

**4. Assessment of the candidate's personal contribution**

**1. Critical remarks and recommendations**

I have no critical remarks regarding the materials submitted for the competition. The materials do not include a list of implementations; I recommend that Chief Assistant Professor Ichkova make an effort in this regard.

**2. Personal impressions**

I do not know Chief Assistant Professor Mariana Dimitrova Ichkova, PhD (Eng.) personally, but the quality of her works leaves an excellent impression on me.

**Conclusion:**

In view of the foregoing, I propose that Chief Assistant Professor Mariana Dimitrova Ichkova, PhD (Eng.) be appointed as Associate Professor in the field of higher education 5. Technical

Sciences, professional field 5.6. Materials and Materials Science, specializing in Materials Science and Technology of Engineering Materials, at the Department of Mechanical Engineering, Computer Systems, and Electrical Engineering at the Technical College – Lovech.

15.10.2026 г. Jury member:

/prof. Stoyko Gyurov/