OPINION

from Prof. Dr. Eng. Angel Petrov Anchev
Technical University of Gabrovo
Department of Materials Science and Mechanics of Materials
on the materials submitted for participation in a competition
for the academic position of „Associate Professor“
in the field of higher education – 5. Technical Sciences
in the professional field – 5.6. Materials Science
specialty – Materials Science and Technology of Engineering Materials.

In the competition for Associate Professor, announced in the State Gazette No. 53/09.06.2026 and on the website of TU-Gabrovo, for the needs of the Department of „Mechanical Engineering, Computer Systems and Electrical Engineering“ at the Technical College of Lovech. The candidate participating in the competition is Senior Assistant Professor Eng. **Mariana Dimitrova Ichkova Ph.D.**, Technical University of Gabrovo.

1. Review of the content and results of the submitted works

The documents with which Senior Assistant Professor Mariana D. Ichkova, PhD, Eng. is participating in the competition for the academic position of "Associate Professor" comply with the Development of Academic Staff in the Republic of Bulgaria Act, its Implementing Rules, and the Regulations for Acquisition of Academic Degrees and Occupation of Academic Positions at the Technical University of Gabrovo. The materials include: a Habilitation Work – 13 related scientific publications in international scientific journals with an Impact Factor, indexed by Web of Science, on the topic: "Improving the Surface Properties and Performance of Metallic Components via SPD with Sliding Friction Contact"; 21 scientific publications in Group "G", of which 2 are in international publications indexed in the world database WoS, 2 are in peer-reviewed international publications, and 17 are in peer-reviewed non-refereed publications; as well as 2 textbooks and 1 teaching manual within the scope of the competition.

The quantitative indicators of the criteria for occupying the academic position of "Associate Professor", pursuant to the Regulations for Acquisition of Academic Degrees and Occupation of Academic Positions at the Technical University of Gabrovo, are fully met.

The documents for the competition also present evidence of 165 citations in scientific publications, all of which are in journals refereed and indexed in SCOPUS. The presented citations in the world databases SCOPUS and WoS always serve as a testament to the quality of the candidate's research activity.

The presented scientific works (indicators B and G) published after the defense of the PhD dissertation are focused on investigating the processes of surface plastic deformation, increasing the fatigue life of structural elements, and developing experimental and simulation models to analyze the mechanical behavior of metallic alloys. Thematically, the publications are organized into three main research areas, which form the research profile of the candidate for the academic position of "Associate Professor" with a clearly pronounced theoretical and applied focus.

The first area is related to improving the surface properties and performance of metallic components via surface plastic deformation (SPD) with sliding friction contact. A classification of static SPD methods has been developed based on the differential-morphological method, and a thorough analysis of scientific publications in the field has been performed. Experimental studies have been conducted on various steels and non-ferrous alloys using different deforming elements and technological regimes. The influence of the main technological parameters on temperature fields, residual stresses, microhardness, microstructure, roughness characteristics, and fatigue limit has been established. Regression models have been developed to predict performance characteristics, and finite element thermomechanical models have been created, the adequacy of which has been verified through comparison with results obtained from X-ray diffractometry.

The second area is aimed at developing technological methods to increase the fatigue life of structural elements with fastening holes. Finite element models of various surface plastic deformation technologies have been developed. The influence of tool geometry and technological parameters on the formation of a field with beneficial compressive residual stresses has been analyzed. Particular attention has been paid to structural elements with holes of complex geometry, where, through a combination of experimental research and numerical modeling, solutions have been proposed to increase fatigue strength and operational reliability. Regression models have also been developed to evaluate the degree of strain hardening around the processed holes.

The third area encompasses experimental and simulation studies of the mechanical characteristics and behavior of metallic alloys. As a result of conducted mechanical tests, constitutive models with isotropic, linear, and non-linear kinematic hardening have been developed, applicable in the numerical modeling of processes related to cyclic loading and residual stress relaxation. Stress concentration factors have been determined for widely used metallic alloys, and regression dependencies have been established, taking into account the influence of geometric and material parameters. The influence of heat treatment regimes and alloying elements on the mechanical properties of tool steels used under elevated operating temperatures has also been investigated.

Overall, the presented works demonstrate a consistent development of research in the field of materials science and surface engineering. The obtained results contribute to

expanding the knowledge regarding the mechanisms of hardening and residual stress formation, as well as to developing new engineering solutions for enhancing the reliability, durability, and operational efficiency of metallic structural elements.

2. General characteristics of the candidate's activities

2.1. Educational and pedagogical activity (work with students and doctoral candidates)

Senior Assistant Professor Mariana Ichkova began her career at the Technical University of Gabrovo in 2008 as an Assistant Professor in the Department of “Technical Mechanics” at the Faculty of Mechanical and Precision Engineering. The following year, she successfully defended her PhD dissertation in Professional Field 5.1 Mechanical Engineering, doctoral program "Applied Mechanics", and was appointed to the academic position of "Senior Assistant Professor". According to the presented reference, Senior Assistant Professor Mariana Ichkova has delivered lectures in 1 discipline and conducted laboratory/seminar classes in 11 disciplines included in the curricula of Bachelor's and Master's degree programs at the Faculty of Mechanical and Precision Engineering and the Faculty of Electrical Engineering and Electronics at the Technical University of Gabrovo.

In addition to her regular work with students, the presented reference indicates that the candidate actively participates as a mentor to students involved in various national educational projects

2.2. Scientific and research activities

The candidate, Chief Assistant Professor M. Ichkova, has participated in 3 national research projects funded by European programs, as well as in 18 projects funded by the national budget, with the Technical University of Gabrovo acting as the beneficiary.

2.3. Implementation activity

The documentation submitted for participation in the competition does not contain evidence of implementation or technology transfer activity by the candidate.

3. Contributions (scientific, applied-research, practical) and their significance for science and practice

Based on the materials submitted for the competition, the candidate has defined 13 scientific and applied contributions, distributed as follows: Finite element models of metalworking processes and mechanical systems have been developed; Efficient combined, hybrid, and eco-friendly processes for improving the surface properties and performance of metallic components have been developed; The "finishing – surface properties – performance" correlations in surface plastic deformation (SPD) have been established; Classification schemes for SPD methods and processes have been developed; Mathematical models of the geometric and mechanical characteristics of the surface layer of metallic components processed via SPD have been developed; Constitutive models of

the material behavior of the surface layers of metallic components during SPD processing have been developed; The correlation between technological heredity and the capability of the SPD process to improve the surface properties and performance of metallic components has been established; The correlation between technological parameters and strain-induced α'-martensite during the SPD of chromium-nickel austenitic steels has been investigated; Mathematical models of the strain hardening and creep behavior of the material around cold-expanded holes in non-ferrous alloys have been developed; Mathematical models of the energy and force characteristics of SPD processes have been developed; The energy balance in the thermodynamic system "deforming element – processed surface" during the SPD process with sliding friction contact has been investigated; Mathematical models of the strain hardening of tough-plastic alloys have been developed; Models of the mechanical characteristics of die steels have been developed.

In addition to the scientific and applied contributions, 2 applied contributions have been presented, distributed as follows: a database of optimal values for the governing factors of the SPD process ensuring minimum roughness, maximum microhardness, and compressive residual stresses has been created; technological equipment for the implementation of SPD processes has been developed.

I accept the contributions as presented by Chief Assistant Professor M. Ichkova, finding them relevant to the topic of the announced competition for the academic position of "Associate Professor".

4. Evaluation of the candidate's personal contributions

From the materials submitted for the competition, it is evident that 4 publications constitute independent scientific works, which comply with the regulatory framework in terms of both quality and quantity. The remaining published research, featured in international journals indexed in SCOPUS and WoS, provides clear evidence of the candidate's skills in obtaining, analyzing, and presenting scientific information. At the same time, it serves as indisputable proof that the achieved scientific, applied, and technical results are to a vast extent the candidate's own personal work. Furthermore, I know the candidate from our joint work in the Department of Materials Science and Mechanics of Materials at the Technical University of Gabrovo, and I have been a direct witness to the efforts invested in the creation of the presented scholarly output.

5. Critical remarks and recommendations

I do not find any significant shortcomings in the content of the materials submitted for participation in the competition for the academic position of "Associate Professor".

However, it should be noted that the candidate's publication activity is characterized by a pronounced irregularity, with a substantial portion of the scientific works being published toward the end of the analyzed timeframe, which does not reflect

a steadily evolving research process. It is recommended that, in the future, scientific results be published more rhythmically and evenly over time, which will facilitate a more comprehensive realization of the potential of the candidate's research activities.

6. Personal impressions

I have known Senior Assistant Professor Mariana Dimitrova Ichkova, PhD, Eng., for more than twenty years as a colleague in the same department and as an active participant in joint research activities. During this period, I have had the opportunity to directly observe her professional development, academic growth, and establishment as a researcher in the field of materials science and Surface Engineering.

Based on my long-standing direct observations of her teaching, research, and expert activities, I consider that the contributions in the materials submitted for the academic position of "Associate Professor" are to a sufficient degree her own work.

7.Conclusion

Based on the scientific works submitted and the scientific-applied and applied contributions contained therein, I support and recommend that **Senior Assistant Professor Dr. Eng. Mariana Dimitrova Ichkova** be appointed to the academic position of **Associate Professor** in the field of Higher Education – 5. Technical Sciences, Professional Field – 5.6. Materials Science specialty – Materials Science and Technology of Engineering Materials.

Gabrovo
15.10.2026

Member of the Scientific Jury:
/ Prof. Angel P. Anchev Ph. D./