# 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 Department of "Materials Science and Mechanics of Materials" at the Faculty of „Mechanical and Precision Engineering“. The candidate participating in the competition is Senior Assistant Professor Eng. **Milka Grigorova Atanasova Ph.D.**, Technical University of Gabrovo.

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

The documents with which Senior Assistant Professor Eng. Milka Grigorova Atanasova, Ph.D. is participating in the competition for the academic position of "Associate Professor" comply with the Act on Development of the Academic Staff in the Republic of Bulgaria, the Regulations for its application, and the Regulations for acquiring academic degrees and occupying academic positions at the Technical University of Gabrovo.

The materials include:

Habilitation thesis – in the form of 10 related scientific publications in international scientific journals with an Impact Factor and/or SJR, indexed in Web of Science and/or SCOPUS, on the topic: "Applications of concentrated energy flows with continuous electron beam for surface hardening and welding of dissimilar materials";

27 scientific publications in group "G", of which 2 are in international publications indexed in the global database SCOPUS, 3 in peer-reviewed international publications, and 20 in peer-reviewed non-refereed publications;

2 textbooks, fully covering the topic of the announced competition.

Evidence of 25 citations in scientific publications is presented in the documents for the competition. All of them are in publications refereed and indexed in WoS and/or SCOPUS. The presence of citations of the candidate's scientific work in the global scientific databases SCOPUS and WoS is always a testament to the high quality of her research activity.

The quantitative indicators of the criteria for occupying the academic position of "Associate Professor", according to the Regulations for acquiring academic degrees and occupying academic positions at the Technical University of Gabrovo, are fully met.

The scientific production of Senior Assistant Professor Eng. Milka Grigorova Atanasova, PhD. after the defense of her doctoral dissertation is review-thematically organized into several areas related to current scientific and applied problems in the field of materials science, advanced welding technologies, Surface Engineering, plastic forming, polymer materials, and physical-metallurgical research. The submitted works are characterized by a comprehensive experimental approach, the use of modern methods for structural and phase analysis, and a clear practical focus towards the development and optimization of technological processes.

A leading place is occupied by research on the electron beam welding of dissimilar materials. Joints between copper, stainless steels, titanium and aluminum alloys, as well as high-strength steels and special cast irons have been investigated. Optimal technological regimes have been determined and the mechanisms of influence of the main process parameters on the formation of the microstructure, phase composition, and mechanical characteristics of the welded joints have been clarified. The conditions for obtaining defect-free heterogeneous joints with controlled formation of intermetallic compounds and secondary phases have been established, which is significant for expanding the application of electron beam welding in modern mechanical engineering.

A significant contribution is also represented by research in the area of surface treatment via concentrated energy flows. The effectiveness of electron beam surface hardening for increasing the operational characteristics of steel products through the formation of modified gradient layers with a favorable phase composition and residual stresses has been proven. A significant increase in microhardness has been achieved while preserving the toughness of the core. In parallel with this, solutions for the restoration of worn working surfaces through combined laser cladding and nitriding have been developed, and the specific features of the electron beam processing of titanium alloys have been clarified.

In the research area "Carbide Austempered Ductile Irons", in-depth studies have been conducted on the influence of structural characteristics and heat treatment regimes on mechanical properties and wear resistance. By using statistical methods and optimization models, optimal technological parameters have been determined to achieve high resistance to abrasive wear and dry friction while maintaining good strength indicators.

A significant portion of the scientific activity is dedicated to the hydrostatic and hydromechanical plastic forming of thin-walled hollow parts. Original experimental setups, tooling, and methodologies for process analysis have been developed. Through theoretical and experimental modeling, the deformation parameters have been optimized, the wall thickness variation has been reduced by 5% to 12%, and the range of technological plasticity of the processed materials has been expanded.

In the field of polymer materials, new bio-based ester compounds and modified polysaccharides obtained via sonochemical synthesis and transesterification have been developed. Their applicability as plasticizers and co-plasticizers for PVC compositions has been proven. Through a complex of spectroscopic and thermal methods, their influence on the structure and physicochemical characteristics of the polymers has been confirmed, establishing an effective plasticizing effect and increased macromolecular mobility.

An addition to the candidate's scientific profile includes the physical-metallurgical investigations of special steels and the development of methodical approaches for the joint application of scanning electron microscopy and X-ray diffraction. New results have been obtained regarding the influence of different cooling regimes on the structure and phase stability of alloyed austenitic steels, and the capabilities of modern analytical methods for the structural and phase diagnostics of materials have been systematized.

The submitted works form a consistent and well-developed research activity, characterized by interdisciplinarity, an applied focus, and a significant contribution to the development of technologies for processing, modifying, and investigating engineering materials. The obtained results have both scientific value and direct applicability in the development and refinement of modern production technologies.

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

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

The career of Senior Assistant Professor Milka Grigorova Atanasova, PhD, Eng. at the Technical University of Gabrovo began in 2001 in the Department of “Materials Science and Technology of Materials”. In 2016, she acquired the educational and scientific degree PhD in the specialty "Mechanical Engineering Technology" with a doctoral dissertation on the topic: "Technology for finishing of holes, implementing the “Spherical Burnishing' method."

According to the presented reference, Senior Assistant Professor M. Atanasova has conducted lectures and laboratory classes in 10 disciplines for students in the Bachelor's degree program within professional fields 5.6 and 5.1, as well as in 3 disciplines for students in the Master's degree program within the same professional fields.

From the submitted documentation, it is evident that she actively works with students in her role as a group coordinator for education in both the Bachelor's and Master's degree programs at the Department of “Materials Science and Mechanics of Materials”. Over the last 5 years, she has been the research supervisor for the diploma projects of more than 30 students in the respective professional field and has participated in 2 national educational projects.

**2.2. Scientific and research activities**

During her career at the Technical University of Gabrovo, the candidate Senior Assistant Professor M. Atanasova, PhD, Eng. has participated in **5 national research projects** funded by European programs, as well as in **17 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 for participation in the competition, the candidate has defined **21 scientific-applied contributions**, organized as follows:

The scientific-applied contributions include results related to the development and refinement of new technological processes, the establishment of regularities between technological parameters, structure, and material properties, as well as the disclosure of the mechanisms of the occurring physical-metallurgical phenomena. This group includes research on the electron beam welding of dissimilar materials, electron beam surface hardening, carbide austempered ductile irons, hydromechanical forming, bio-based plasticizers, and the physical-metallurgical characteristics of various metallic materials. The obtained results enrich the existing knowledge in the respective scientific fields and create prerequisites for subsequent practical application.

In the category of **applied contributions**, **13 results** are classified, which are related to the development and implementation of concrete technological solutions, engineering designs, experimental stands, devices, and tooling, as well as to the definition of practically applicable technological regimes. These contributions are of direct importance for engineering practice and create opportunities for increasing the efficiency of production processes, as well as the quality and operational characteristics of the products.

In summary, it can be accepted that most of the presented results are of a scientific-applied nature, as they are aimed at revealing new dependencies, mechanisms, and technological regularities in the processing and investigation of materials. This testifies to the successful combination of fundamental research with a practical focus and to the existence of a clear connection between the scientific results and their engineering application.

I accept the contributions as presented by Senior Assistant Professor Milka Grigorova Atanasova, PhD, Eng. as fully corresponding to the subject of the announced competition for occupying the academic position of "Associate Professor".

**4. Evaluation of the candidate's personal contributions**

I have no doubt regarding her personal contribution to the achieved scientific-applied results. Proof of their high quality is found in the publications in international journals

indexed in SCOPUS and Web of Science. Furthermore, the fact that 5 of the submitted scientific works are independent should not be overlooked, as they meet the requirements of the Regulations for acquiring academic degrees and occupying academic positions at the Technical University of Gabrovo in terms of both quality and quantity.

**5. Critical remarks and recommendations**

I find no significant shortcomings in the content of the materials submitted for participation in the competition for the academic position of "Associate Professor".

Alongside the undeniably valuable research in the field of electron beam technologies, group "G" includes publications dedicated to hydrostatic forming, studies on cast irons, and even the sonochemical synthesis of bio-based plasticizers for polymers. This interdisciplinarity somewhat diffuses the clear research profile of the candidate.

I recommend that in her future research and teaching activities, Senior Assistant Professor Milka Grigorova Atanasova, PhD, Eng. concentrate her efforts primarily on developing her leading area of expertise – the applications of concentrated energy flows and surface engineering, where her potential is most strongly pronounced.

**6. Personal impressions**

I have known Milka Atanasova since her early days at the Technical University of Gabrovo and have witnessed the consistent efforts she puts into her scientific, teaching, and organizational work. For the past 6 years, we have been colleagues in the Department of “Materials Science and Mechanics of Materials” at the Technical University of Gabrovo, allowing me to closely observe her professional activity and growth as a researcher in the field of materials science.

Based on my observations of her teaching, research, and expert activities, I consider her contribution to the submitted materials for occupying the academic position of "Associate Professor" to be, to a sufficient degree, her own personal 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. Milka Grigorova Atanasova** 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./