OPINION

by Prof. Irina Stefanova Aleksandrova, PhD, Eng. – Technical University – Gabrovo

regarding the materials submitted for participation in the competition
for the academic position of "Associate Professor" in
the field of higher education – 5. Technical Sciences,
in professional field – 5.1 Mechanical Engineering,
specialization – "Mechanical Engineering Technology"

In the competition for the academic position of "Associate Professor", announced in the State Gazette, Issue No. 53, June 9, 2026, and on the website of the Technical University of Gabrovo (TU-Gabrovo) for the Department of Industrial Technologies and Design within the Faculty of Mechanical Engineering and Instrumentation, Chief Assistant Professor Kalin Vladimirov Anastasov, PhD, Eng. – TU-Gabrovo – is participating as a candidate.

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

In the competition for the academic position of "Associate Professor", Chief Assistant Professor Kalin Anastasov, PhD has submitted 28 academic works, of which: habilitation thesis – 14 scientific publications (В.4.1 – В.4.14) in journals referenced and indexed in world-renowned scientific databases (Web of Science and/or Scopus), 12 of which have an impact factor, and 2 – an SJR; one scientific publication (Г.7.1) in a journal that is refereed and indexed in world-renowned scientific information databases (Scopus), with an SJR, and 13 scientific publications (Г.8.1 – Г.8.13) in non-refereed peer-reviewed journals or in edited collective volumes. The candidate's independent works number 8 [Г.8.1, Г.8.3, Г.8.4, Г.8.7, Г.8.9 – Г.8.12], 6 [В.4.9, В.4.14, Г.8.5, Г.8.6, Г.8.8, Г.8.13] – have one co-author, 2 [В.4.8, Г.8.2] – have two co-authors, and 12 – have three or more co-authors [В.4.1 – В.4.7, В.4.10 – В.4.13, Г.7.1]. Sixteen of the publications are in English [В.4.1 – В.4.14, Г.7.1, Г.8.2].

The candidate in the competition meets the quantitative criteria in accordance with the minimum national requirements and the minimum requirements of the Technical University of Gabrovo for appointment to the academic post of "Associate Professor". He has successfully defended a doctoral thesis entitled: "Investigation of the performance of cutting tools manufactured using the injection moulding method" to obtain the academic and scientific degree of "Doctor" under the doctoral programme "Cutting of Materials and Cutting Tools" (Indicator А – 50 points). He has submitted: a habilitation thesis comprising 14 scientific publications in journals that are refereed and indexed in world-renowned scientific databases (Indicator В – 199.5 points); one scientific publication in a journal referenced and indexed in world-renowned scientific databases (Г7) and 13 scientific publications in non-referenced peer-reviewed journals or in edited collective volumes (Г8) (Indicator Г – 214.6 points) ; 55 citations – 43 in scientific publications referenced and indexed in world-renowned scientific information databases (Д12) and 12 in non-referenced peer-reviewed journals (Д14) (Indicator Д – 454 points). He has participated in one national project and in four research projects funded by the university's "Scientific Research" fund; he is the author of one university textbook and one study aid.

2. General ccharacteristics of the candidate's activity

2.1. Teaching and pedagogical activity (work with students and doctoral students)

Chief Assistant Professor Kalin Anastasov is a lecturer in the Department of Industrial Technologies and Design at the Technical University of Gabrovo. Since joining the university (in 2020), he has successively held the academic posts of "Assistant" and "Chief Assistant Professor" (from 2024 to the present). According to the report submitted on the teaching hours at the Technical University of Gabrovo, he has delivered:

- for students at the Bachelor's degree level – lectures and laboratory sessions in the courses "Tooling and Machinery", "Specialised (non-standard) Machining Methods and Tools", "Unconventional Technologies in Mechanical Engineering", "Technologies and Equipment for Machining Non-metallic Materials", "Electrophysical and Electrochemical Machining Methods" and "Unconventional Methods for Materials Processing"; lectures on the course "Powder Metallurgy"; laboratory exercises on the courses "Metal-Cutting Tools" and "Tool Manufacturing Technology"; a course project on "Metal-Cutting Tools";

- for students at the Master's degree level – lectures and laboratory exercises on the course "Design of Tooling for Injection Moulding".

Chief Assistant Professor Anastasov is the author of one university textbook ("Unconventional Industrial Technologies") and one university study guide ("Guide to a Course Assignment on Tooling and Machinery"). He has supervised 13 graduation students who successfully defended their diploma theses. He has participated in the modernisation and fitting out with tooling equipment of two teaching laboratories – "Plastic Injection Moulding" and Laboratory 1005 (for conducting laboratory exercises in "Tooling Production Technology" and "Metal-Cutting Tools").

2.2. Research and applied research activities

The candidate's research and publications can be categorised into the following thematic areas: Design and investigation of combined, hybrid and sustainable technological processes for surface plastic deformation (SPD) to increase fatigue strength and improve fatigue life and Surface Integrity (SI) characteristics of metal components [В.4.1 – В.4.5, В.4.8, В.4.11, В.4.12, В.4.14, Г.8.2]; Investigation of process inheritance on SI in combined, hybrid and sustainable cutting and plastic deformation processes [В.4.6, В.4.7, В.4.10, В.4.13]; Investigation of the influence of the type of tool material on SI in combined plastic deformation processes [В.4.9, Г.8.5, Г.8.12]; Technological processes and equipment for high-pressure die-casting of aluminium and zinc alloys [Г.7.1, Г.8.4, Г.8.9, Г.8.10]; Investigation of sustainable and conventional cutting processes and their effect on the SI of the machined surface [Г.8.1, Г.8.3, Г.8.6]; Additive technologies, computer-aided manufacturing and investigation of material properties [Г.8.7, Г.8.8, Г.8.11, Г.8.13].

According to the submitted research activity report, Chief Assistant Professor Anastasov has participated in: 4 projects funded by the university's "Scientific Research" fund ("Surface hardening of rotational specimens made of medium-carbon structural steel by electron beam treatment"; "Influence of the type of tangential contact during SPD with a toroidal deforming roller on the tribological behaviour of austenitic stainless steel"; "Innovative technologies and tooling in mechanical engineering"; "New tools and technologies in mechanical engineering"); one project funded by OP SESG – BG16RFPR002-1.014-0005-C01 "Smart Mechatronics, Eco- and Energy Saving Systems and Technologies".

2.3. Implementation Activities

Chief Assistant Professor Anastasov presented certificates of implementation for technological processes of: laser welding of polymer parts and the restoration of tooling equipment via laser cladding at the company "Izi Plast BG" EOOD in Gabrovo; the manufacturing of parts using MIM technology and additive technologies, and the heat treatment of tool and structural steels at the company "Armako Industries AD" in Lyaskovets.

3. Contributions

I accept the scientific-applied and applied contributions formulated in the submitted works. They can be summarized as follows:

Scientific-applied contributions:

- A new method for SPD via slide rolling burnishing (SRB) with a toroidal roller has been theoretically substantiated and experimentally approved, achieving a twofold reduction in roughness compared to analogous SPD processes with rolling burnishing (RB) friction contact [B4.1].

- Environmentally sustainable processes have been developed and optimized for diamond burnishing (DB) and the combined machining of parts made of steels (AISI 316, 42CrMo4) and leaded brass (CuZn39Pb3). By selecting dry or cooled operating modes (with liquid nitrogen or via a vortex tube), mirror-like surfaces (Ra = 0.041–0.089 μm) and a deeply modified surface layer (compressive stresses at a depth exceeding 0.5 mm and a submicrocrystalline structure) were achieved, demonstrating the possibility of effective machining without the traditional use of flood lubrication [B.4.3, B.4.5, B.4.7, B.4.8].

- It has been experimentally proven that the optimized modes of diamond burnishing and the SPD processes using a toroidal roller via rolling and controlled sliding generate compressive residual stresses at depths exceeding 0.5 mm and a favorable surface texture. This increases the strength and fatigue life of the materials studied: for 42CrMo4 steel, the fatigue limit increases by 20 MPa, and the fatigue life increases more than 70-fold; for CuZn39Pb3 brass, the fatigue limit increases by up to 13.2% compared to conventional processing [B.4.1, B.4.3, B.4.5, B.4.12 – B.4.14].

- The microstructural transformations and microhardness in the surface layer during SPD (DB, RB, SRB) of AISI 304 and AISI 304L steels were investigated. It was demonstrated that surface microhardness depends to a greater extent on feed rate than on force, while this trend reverses with depth. The thickness of the hardened layer ranges from 10 μm (for RB and smoothing SRB) to over 20 μm (for hardening SRB). A mathematical model of strain-induced α'-martensite in DB has been developed, demonstrating the greater significance of the thermal effect compared to the mechanical effect [B.4.2, B.4.9].

- An approach for multi-objective optimization in the "turning–SPD" process sequence has been developed, taking into account the effect of tool wear on surface integrity to ensure minimal roughness and an increased fatigue limit. A combined technology (heat treatment + DB) has been developed for three-component hardening of additively manufactured steel parts (17-4PH), ensuring high compressive residual stresses [B.4.4 – B.4.6, B.4.10, B.4.11, Г.8.2].

- The zones and phase state were determined for the combined treatment of tool steel (1.2343) via laser cladding followed by nitriding. Effective microstructural refinement and a 50% higher microhardness of the clad layer compared to the base material were demonstrated for die-forming elements [Г.7.1].

Practical contributions:

- Optimal machining parameters for SPD of various materials have been determined: the parameters for dry diamond burnishing of C45 steel have been defined, ensuring maximum wear resistance under friction and compensating for tool wear from the previous turning operation [B.4.4 – B.4.6, B.4.10]; the conditions for finishing leaded brass (CuZn39Pb3) with deforming elements made of Ferro-Tic Grade C [B.4.7, B.4.9] and for the RB process on 42CrMo4 steel [B.4.14] have been established.

- Comprehensive solutions have been developed for modern manufacturing technologies, including: the post-processing of additively manufactured steels (LPBF 17-4PH) to achieve mirror-like surfaces [B.4.11]; the 3D printing of parts made from tooling materials [Г.8.13]; a hybrid technology for the laser cladding and nitriding of 1.2343 steel dies [Г.7.1, Г.8.10]; a hybrid combined process for dry finishing machining [B.4.13]; and the systematization of the production capabilities of the RAIS T2500 turning-milling center **[**Г.8.11**]**.

- Solutions for industrial monitoring have been developed: empirical models for predicting surface roughness during turning and laser modification of 42CrMo4, 45, and 1.3343 steels [Г.8.1, Г.8.3, Г.8.8]; evaluation of dimensional stability during high-pressure die casting

of aluminum alloys [Г.8.4**]**; and analysis of operational defects in beryllium bronze pistons [Г.8.9].

4. Evaluation of the candidate's personal contribution

The evaluation of Chief Assistant Professor Anastasov's personal contribution to teaching and applied research is entirely positive. Evidence of the significance of his achievements is provided by the presented 43 citations in prestigious publications, which are peer-reviewed and indexed in world-renowned databases. These results demonstrate that the candidate is an established author with recognized publications in the field of the competition.

5. Critical Comments and Recommendations

I did not find any significant omissions in the works of Chief Assistant Professor Anastasov. However, I believe that the formulated contributions should be systematized, as they are currently presented in a rather fragmented manner. I recommend that the candidate summarize the results achieved in a monograph**,** as well as continue to develop his expert and implementation activities**.**

6. Personal Impressions

I know Chief Assistant Professor Kalin Anastasov, PhD, as a respected colleague. I have no joint publications with him. I am not a related party to him within the meaning of Paragraph 1, Item 5 of the Supplementary Provisions of the Act on the Development of Academic Staff in the Republic of Bulgaria. My assessment of the candidate's contributions and results in the competition is entirely positive.

Conclusion:

In view of the above, I propose that Chief Assistant Professor Kalin Vladimirov Anastasov, PhD, Eng., be awarded the academic position of "Associate Professor" in the field of higher education 5. Technical Sciences, professional field 5.1 Mechanical Engineering, specialization "Mechanical Engineering Technology".

28 Oct 2026

Jury Member:
/Prof. I. Aleksandrova/