

OPINION

By Prof. Irena Georgieva Markovska-Minova,
Member of the scientific jury, appointed by Order No. RD-293/19.09.2022 of rector of the
University "Prof. Dr. Asen Zlatarov"-Burgas.

Subject: competition for the academic position "professor" in the professional field 5.1. "Mechanical engineering, scientific specialty 02.01.25 - Machines and equipment for the chemical, oil, gas and oil refining industries", announced in State Gazette - no. 45/17.06.2022

Assoc. prof. Dimitar Rusev Rusev is the only candidate for the announced competition. All documents have been submitted, in accordance with the Rules for Acquiring Scientific Degrees and Holding Academic Positions at the University "Prof. Dr. Asen Zlatarov".

1. Brief biographical data and analysis of the candidate's career profile

Assoc. prof. Dimitar Rusev Rusev completed his higher education as a engineer - constructor in 1985 at the Moscow Institute of Chemical Mechanical Engineering, scientific specialty "Design of machines and apparatus for the chemical industry", Moscow (Russia). In 1990, he defended successfully dissertation for obtaining an educational and scientific degree "doctor" in the field of higher education 5. Technical sciences, professional direction 5.1. Mechanical engineering, scientific specialty "02.01.25 - Machines and equipment for the chemical, oil, gas and oil refining industries", with supervisor Prof. Ph.D. Dimitar Tomov Mitev. From 1990 to 1992, he was a research fellow 3rd degree at the "Fluidized Bed" Research Institute at the University "Prof. Dr. Asen Zlatarov", Burgas. From 1992 to 1995, he has worked as a deputy director at "ZMM" - Burgas. From 1995 until now, the candidate has been a teacher in the Department of "Electronics, Electrical Engineering and Mechanical Science" at the University "Prof. Dr. Asen Zlatarov" - Burgas, resp. from 1995 to 2006, he is a chief assistant, and since 2006 he is an associate professor. During this period, he was the Director of the Technical College at the university from 2008 to 2012 and from 2020 until now.

Assoc. prof. Dimitar Rusev is a member of the Editorial Board of the international journal MIAZ "Crede Experto", ISSN2312-1327. This journal is indexed in the international databases: eLIBRARY.RU, Ulrichsweb, Pubicon Science Index, Scientific Indexing Service, Research Bible, Inno Space, Journal Index, Universal Impact Factor, Scholarsteer, Academic Keys, Turk Egitim Index, etc.

Analysis of the candidate's autobiographical data, testifying to a solid education and professional experience in a professional direction 5.1. Mechanical Engineering.

2. General description of the submitted materials for the competition

In order to participate in the competition, Assoc. prof. Dimitar Rusev Rusev presents scientometric data that exceed in volume the minimum required indicators for occupying the academic position of "professor" according to the Rules for Acquiring Scientific Degrees and Holding Academic Positions at the University "Prof. Dr. Asen Zlatarov".

The candidate submitted a total of 66 scientific works in order to participate in the current competition.

According to group A - indicator 1 - a dissertation was defended for the award of an educational and scientific degree "doctor" in 1990 on the topic: "Investigation of some basic problems of the operation of the equilibrated layer at pressures other than atmospheric".

According to group B - indicator 4 - 10 scientific works are presented which are referenced and indexed in world famous databases with scientific information. The total number of points in "group B" is 217, which exceeds the minimum number of points 200 of the requirements of the University "Prof. Dr. Asen Zlatarov" - Burgas.

According to group D - indicator 5 - one monograph on the topic "Technological thermodynamics" was published, in - indicator 7 - the candidate has 6 scientific publications that are referenced and indexed in world famous databases with scientific information, and in - indicator 8 - (scientific publications in non-refereed journals with scientific review or in edited collective volumes) the candidate presents 50 scientific publications. 29 of the presented scientific publications have been published in conference proceedings and are included in the National Reference List of National Centre for Information and Documentation with peer review, and 4 of them are abroad. The total number of points in "group D" is 609.9, which exceeds the minimum number of points 500 of the requirements of the University "Prof. Dr. Asen Zlatarov" - Burgas.

According to group D - indicator 12 - (citations or reviews in scientific publications, referenced and indexed in world-famous databases with scientific information or in monographs and collective volumes) the candidate presented 65 citations, and in indicator 14 - (citations or reviews in non-refereed journals with scientific review) - 6 issues. The total number of points of "group D" citations is 602, which exceeds the minimum number of points of 200 from the requirements of the University "Prof. Dr. Asen Zlatarov" - Burgas.

According to group E - indicator 17, a certificates are presented as an assurance that the candidate was the scientific supervisor of 3 successfully defended doctoral students. In - indicator 18 - (Participation in a national scientific or educational project) are presented: participation in 1 project financed by the European Social Fund of the European Union and with the financial support of the Operational Program "Development of Human Resources"; 1 project financed under the E-PLUS National Scientific Program; 5 participations in national scientific projects at the Ministry of education and Science - Scientific Research Fund. All presented participation in projects are on the theme of the competition. C - indicator 23 - (Published university textbook or textbook that is used in the school network) the candidate submitted a published textbook on "Technical documentation" and a textbook on "Machines and apparatus in the chemical industry" - electronic edition. C - indicator 25 - (published patents and utility models), the following are presented: 1 submitted patent's application "Technology and tank for storing hydrogen in absorption state"; 1 application for a utility model "Hydrogen storage tank in an absorption state" has been submitted, with a registration decision issued. C - indicator 26 - the applicant has recognized 3 invention patents: "High-voltage technology for obtaining graphene and applying it as a surface coating on a metal substrate"; "Emulsion Separation Reactor Using Fractal Systems"; "Method for deposition of graphene coating on polymer substrate by electric arc technology". The total number of points in "Group E" is 350, which exceeds the minimum number of points 200 of the requirements of the University "Prof. Dr. Asen Zlatarov" - Burgas.

3. Analysis and evaluation of the candidate's scientific contributions

The presented scientific and scientific-applied works of assoc. prof. Dimitar Rusev are on the topic of the competition. They are characterized by the innovative approach to solving the different tasks. In this regard, the presented monograph "Technological Thermodynamics" can be noted, offering new directions and innovative solutions in the study of thermodynamic processes taking place in ORC installations. The candidate's scientific publications are characterized by thoroughness, analyticalness and an innovative approach to solving the problems in the topics under consideration. The use of the 3D design of machines and devices and the simulation study of the processes taking place in them reflect the modern innovative approaches in the development of machine-building equipment.

In the presented contributions, the information about the applicant's scientific and scientific-applied research is clearly and in detail structured and is presented in six main directions:

1. Development of machine and apparatus designs and improvement of energy efficiency and turbine designs for ORC-installations - in this direction, in-depth researchs has been carried out using modern computer systems for 3D design and simulation modeling, and methodologies and mathematical models have been developed for the description of hydrodynamic and thermal processes in machines and devices, new constructions have been developed on the basis of these studies. The operation of the ORC-installations was investigated and the thermal and hydrodynamic expansion processes in the turbine were optimized using computer modeling. New constructive solutions are proposed for shaping the blades of the turbine impellers, on the shaft, and a new type of nozzle apparatus allowing polytropic expansion of the freon is proposed. Scientific developments from this direction have been implemented in practice.
2. Hydromechanical researchs and optimization of mechanical structures - in this direction, scientifically based studies of the hydrodynamic processes taking place in machines and devices were carried out and, with the help of simulation design, methods were developed for their description. Using these methods, the structures of reactors, cyclones, fluidized bed apparatus and turbines for ORC-installations have been optimized.
3. Application and study of the mechanical characteristics of surface coatings applied to metal and polymer materials - in this direction, the processes of formation and application of protective and wear-resistant coatings on metal and polymer substrates were studied. Based on these studies, new technologies have been developed and proposed for applying a wear-resistant coating on Polipa®PA6 and Polikes®PA6G polyamide structures. New technologies are proposed for the formation of: surface metal composites based on SiC (silicon carbide) using electric arc technology; forming metal matrix composites from stainless steels X2CrTi12, X5CrNi18-10 and X1NiCrMoCuN20-18-7 with SiC and TiC content, and the same steels with tungsten carbide (WC) content and Stellite 6; a new method for applying metallic copper nanocoating, using high-voltage technology, on Polilikes®PA6G polymer material; new technology and optimal modes for high-voltage sputtering of graphene and deposition of a monolayer of graphene coating, on a polymer and metal substrate in order to obtain a capacitive nanocoating.
4. Simulation studies and optimization of mechanical structures and the strength characteristics of applied coatings - in this direction, new approaches and methods have been developed and proposed for simulation prediction of the geometrical, mechanical and tribological characteristics of investigated X18H9T and Ti coatings on PS/SB190 crystal, PS/SB793 shockproof POLIPOM®POM, with the aim of optimizing deposition modes under selected main criteria: adhesion strength, microhardness and wear resistance. Methodologies for simulation

structural modeling and analysis of the loads occurring in the structures of the machines and devices operating under pressure are proposed.

5. Synthesis of new materials - in this direction, research has been carried out and technologies have been proposed for: granulation of fly ash from coal - industrial waste from thermal power plants and obtaining sintered granules, which are a good thermal insulation material and have sorption properties for cleaning up oil spills; granulating waste carbon black and obtaining granules of the required shape, composition, size and density that can be used in the rubber industry; production of highly porous ceramics based on SiO_2 , Al_2O_3 , graphite, CaCO_3 and barium titanate with high dielectric constant. The oxidation kinetics of copper pyrometallurgical iron silicate (fayalite) slag was investigated and a method for the oxidation of fine iron silicates in a high temperature "fluidized bed" was proposed. A technology for obtaining glass ceramics from natural materials as well as from industrial waste (ash from thermal power plants, metallurgical slag, etc.) containing oxides is proposed. A technology for obtaining lightweight ceramic materials with a clay matrix and filler from biowaste (rice husks, rye straw, etc.) as porous forming materials for use in modern construction is proposed. Research has been done and a technology for synthesizing porous wollastonite ceramics using the two-stage technology is proposed - $\text{Ca}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$ and $\text{Na}_2\text{SiO}_3 \cdot 9\text{H}_2\text{O}$, as well as Na_2SiO_3 and CaCl_2 were used as starting materials. Calcium silicate powders are synthesized by the chemical coprecipitation method and as a result are highly finely dispersed. A technology for obtaining an electrically conductive graphite-based paste is proposed.

6. Management, organization and optimization of the learning process - in this direction, a scientifically based study of the new requirements in the way of training students was carried out and a new system for training full-time and part-time students in the disciplines of Engineering Graphics, Technical Documentation and Mechanical Science was introduced. The system complies with the new requirements of BDS ISO and BDS EN ISO, and modern distance learning tools have been introduced.

4. Analysis and assessment of pedagogical activity

Assoc. Prof. Dimitar Rusev has 27 years of teaching and teaching experience - 11 years of experience as a chief assistant and 16 years as an associate professor, this shows a significant pedagogical activity of the candidate.

He is the co-supervisor of three successfully defended doctoral students - Dr. Svetla Boshnakova, Dr. Ivan Gradinarov and Dr. Dimitar Georgiev.

Assoc. Prof. Rusev has a significant educational workload with the students of the Bachelor's degree, the Professional Bachelor's degree and the Master's degree. His educational and pedagogical activity is related to the development and conduct of lecture courses, seminar exercises and practical classes. Of interest are the developed video-lecture courses and exercises for distance learning in the discipline "Engineering Graphics", which is an innovative solution in line with modern trends in education development.

He leads lectures and exercises in 21 disciplines to students from more than 30 specialties in full-time and part-time study at the university.

In conclusion, it can be summarized that the candidate is a teacher with extensive experience in a wide range of disciplines in the field of technical sciences.

5. Critical notes and recommendations

I have no critical remarks and recommendations

6. Conclusion

On the basis of the presented materials and my personal impressions, I would like to point out that, assoc. prof. eng. Dimitar Rusev meets the requirements laid down in the Law on the Development of the Academic Staff of the Republic of Bulgaria and the Rules for Acquiring Scientific Degrees and Holding Academic Positions at the University "Prof. Dr. Asen Zlatarov"-Burgas and he is suitable for holding the academic position of "Professor".

With the presented scientific, teaching and scientific applied production, he proves that he is a built scientist with national and international authority.

Based on the above mentioned my recommendation to the esteemed members of the Faculty of Technical Sciences is to vote affirmatively for Assoc. Prof. Dimitar Rusev, PhD, to acquire the academic position of "Professor" in the scientific specialty "02.01.25 - Machines and facilities for the chemical, oil, gas and oil refining industries".

27th October 2022

Burgas

Member of the Scientific Jury:

/ prof. Irena Georgieva Markovska-Minova /