

REVIEW

on a contest for the academic position "Associate Professor" under professional direction "5.1. Mechanical Engineering",

announced in Government Gazette № 2, 05.01.2024,

with candidate Chief Assistant PhD Eng. Daniela Todorova Spasova

Reviewer: Prof. PhD Angel Marinov Velikov

GROUNDNS for preparing the review: **Order № 178/20.03.2024** of the Rector of TU Varna.

1. General and biographical data

Ch. Assist. PhD Daniela Todorova Spasova graduated from TU Varna in 2005. Since 2009 she has been working at the University as an assistant and chief assistant. In 2017, she defended his doctoral thesis on the scientific specialty Materials Science and Technology of mechanical engineering materials .

The applicant's education and professional experience are in engineering specialties.

2. General description of the presented materials

The applicant has submitted for review a total of 30 scientific works, of which 10 are for habilitation work, and from the rest - 1 as publications according to criterion „Г7“ and 19 according to criterion „Г8“.

The applicant's works are grouped by NACID (НАЦИД) as follows:

Criterion A: Indicator 1 - Dissertation work for awarding the educational and scientific degree "doctor" - **1 issue, 50 points**;

Criterion B: Indicator 4 - Habilitation work - 10 scientific publications in referenced and indexed in world-famous databases with scientific information - **239 points** out of the required 100;

Criterion „Г“: Sum of indicators 7 and 8 – **215.01** points out of required 200;

Criterion „Д“: Indicator 12 – 100 points out of the required 50;

The applicant's works are recognizable among the scientific community worldwide. Because of that from the Scopus reference can be seen that the applicant is visible with 11 (eleven) papers and 10 (ten) citations.

The applicant meets and exceeds the minimum national requirements and the requirements of the Rules of TU Varna for the position of Associate Professor.

3. General characteristics of the candidate's research and applied scientific activity.

The works presented for the contest from the research activity of Ch. Assistant PhD Daniela Todorova Spasova can conditionally be divided into groups as follows:

1.	scientific publications in referenced and indexed in world-famous databases with scientific information	11 items
2.	Scientific publications in non-refereed journals with scientific reviewing or in edited collective volumes	19 items.

The first group (I), a total of 10 publications are united as equivalent to a monographic work on the topic:

"RESEARCH OF MATERIALS AND TECHNOLOGIES APPLICABLE TO FACILITIES IN THE MARINE AND MINING INDUSTRY"- **B.4.1, B.4.2, B.4.3, B.4.4, B.4.5, B.4.6, B.4.7, B.4.8, B. 4.9, B.4.10;**

The second group (II) includes 20 publications, systematized in thematic works, in the following areas:

1. Development of new and improvement of existing methods and technologies for making casting molds and obtaining complex non-technological castings from various alloys (5 publications) - G.8.1, G.8.2, G.8.3, G.8.16, G8.18 (Г.8.1, Г.8.2, Г.8.3, Г.8.16, Г8.18).
2. Conducting research on technologies for the production of composite materials and evaluation of their quality and properties (5 publications) - G.8.5, G.8.6, G.8.7, G.8.8, G.8.14 ((Г.8.5, Г.8.6, Г.8.7, Г.8.8, Г8.14).
3. Research on the application of software products for automation the processing of data and modeling of thermal processes (2 publications) - G.7.1, G.8.10 (Г.7.1, Г.8.10).
4. Increasing the strength and operational characteristics of construction materials through additional applied technological processes (5 publications) - G.8.4, G.8.9, G.8.11, G.8.15, G.8.17, G.8.19 (Г.8.4, Г.8.9, Г.8.11, Г.8.15, Г8.17, Г.8.19).
5. Conducting researches, quality control and restoration activities on the exploitation condition of production sites (2 publications) - G.8.12, G.8.13 (Г.8.12, Г.8.13).

The topic of the applicant's works completely coincides with the topic (nomenclature) of the competition.

4. Evaluation of the pedagogical training and activity of the candidate.

The teaching activity of Ch. Assistant PhD Eng. Daniela Todorova Spasova, can be seen from the given lectures, according to the table:

Ed. year	Discipline	Horarium
2020-2021	„Инженерни материали и обработващи технологии“ за ОКС „Бакалавър“, спец. ЗНБА, 2 к., задочно обучение "Engineering materials and processing technologies" for OCS "Bachelor", specialty ZNBA, 2 course, correspondence study	15
	„Материалознание и технология на материалите“ за ОКС „Бакалавър“ специалности ИД, ИМ, ТПИ, ЗНБА, ИЕ - 1 курс, редовно обучение Materials science and technology of materials" for OCS "Bachelor" specialty ID, IM, TPI, ZNBA, IE - 1 course, regular education	30
	„Специални технологии в металолееенето“ за ОКС „Магистър“, спец. ХМ 1 курс, ХМ-4- 2 курс и ТТОМ-4- 2 курс, задочно обучение "Special technologies in metal casting" for OCS "Master", specialty HM 1 course, HM-4- 2 course and ТТОМ-4- 2 course, distance education	15
	“Материалознание и технология на материалите” за ОКС „Магистър“, спец. ТВЕИ-6 – 1 курс, задочно обучение "Materials Science and Materials Technology" for OCS "Master", specialty TVEI-6 - 1 course, distance learning	15
2021- 2022	“Материалознание и технология на материалите” за ОКС „Бакалавър“ специалности ИД, ИМ, ТПИ, ЗНБА, ИЕ - 1 курс, редовно обучение Materials science and technology of materials" for OCS "Bachelor" specialty ID, IM, TPI, ZNBA, IE - 1 course, regular education	30
	„Специални технологии в металолееенето“ за ОКС „Магистър“, спец.ХМ 1 курс, ХМ-4- 2 курс и ТТОМ-4- 2 курс, задочно обучение "Special technologies in metal casting" for OCS "Master", specialty HM 1 course, HM-4- 2 course and ТТОМ-4- 2 course, distance education	15
	“Материалознание и технология на материалите” за ОКС „Магистър“, спец. ТВЕИ-6 – 1 курс, задочно обучение "Materials Science and Materials Technology" for OCS "Master", specialty TVEI-6 - 1 course, distance learning	15
2022- 2023	“Материалознание и технология на материалите” за „Бакалавър“ специалности ИД, ИМ, ТПИ, ЗНБА, ИЕ - 1 курс, редовно обучение Materials science and technology of materials" for OCS "Bachelor" specialty ID, IM, TPI, ZNBA, IE - 1 course, regular education	30
	„Специални технологии в металолееенето“ за ОКС „Магистър“, спец.ХМ 1 курс, ХМ-4- 2 курс и ТТОМ-4- 2 курс, задочно обучение "Special technologies in metal casting" for OCS "Master", specialty HM 1 course, HM-4- 2 course and ТТОМ-4- 2 course, distance education	15
	“Материалознание и технология на материалите” за ОКС „Магистър“, спец. ТВЕИ-6 – 1 курс, задочно обучение Material Science and Materials Technology" for OCS "Master", specialty TVEI-6 - 1 course, distance learning	15
Total points for the author under indicator "Ж.29."		195

It can be seen, from the above, that the applicant repeatedly exceeds the required minimum.

5. Basic scientific and scientific and applied contributions.

Scientific and applied contributions

1. An engineering software based on DPs was created to calculate stresses and strains in pre-insulated connected pipe systems for heat transfer networks, which, although elementary, reduces the design efforts by automating the data processing. - G.7.1 (Г.7.1).
2. A mathematical model of the thermal interaction between the matrix and the reinforcing phase forming MMCs was created, which reveals the main mechanisms, controlling the formation of complex structures in the construction of cast metal composites by the "capillary molding" method. - G.8.10 (Г.8.10).
3. Vacuum pulse casting technology has been developed, allowing the production of thin-walled, solid castings with complex relief and significantly reduced production costs, compared to conventional technologies. - G.8.1, G.8. (Г.8.1, Г.8.).
4. A methodology has been developed for obtaining a ceramic shell on an electrically conductive wax model, which exactly copies the model block, by chemical method of creating of an electrically conductive layer that makes it possible to be controlled, depending on the technological requirements to the foundry mold, the thickness of the shell, which is formed. - G.8.3. (Г.8.3).
5. A methodology has been created for the formation of a surface layer between two liquid phases (coating of the mold and melt) of castings from aluminum and copper alloys, as a result of the formation of a temperature field ensuring contact of the melt with the coating, while both are in a liquid state, in this way, the surface of the casting is formed on a liquid phase, providing a lower roughness - G.8.16 (Г.8.16)..
6. It has been established the possibility of applying the "capillary molding" method in the production of two-layer casting molds (using different coatings) through the fusible models, to obtain castings with low roughness from non-ferrous alloys.- G.8.18 (Г.8.18).
7. An innovative production method was created for obtaining composites with a metal matrix (MMCs), with a controllable geometry of the reinforcing phase and the metal matrix, which leads to an increase in the mechanical and exploitation properties of the obtained materials; - B.4.1, B.4.2, B.4.5.

8. During the production of MMCs with a metal strengthening phase, an interaction of the liquid metal matrix with the strengthening phase was established, as a result of which new phases and structures are formed, leading to an increase in mechanical properties that cannot be obtained with conventional casting methods - B.4.1.
9. Various types of composite materials with a polymer matrix suitable for the manufacture of equipment operating in a marine environment, with mechanical properties close to metallic materials and with a significantly lower density, have been created. - B.4.3, B.4.4, B. 4.9.
10. A simulation model was created for choosing the operating mode and determining the durability of materials tested for cyclic fatigue, by which is calculated the natural resonance frequency of the tested materials and the approximate number of load cycles - B.4.6.
11. A methodology has been developed for establishing the modes of crack development depending on the chemical and technological conditions during cyclic fatigue loading and subsequent destruction of the studied specimens. B.4.6, B.4.7, B.4.8

Applied Contributions

1. Expanding the functionality of the software system for calculating stresses and elongations in isolated pipe systems, which takes into account the change in length, by adding: dimensioning of compensators; linear extensions in tees; dimensioning of the number and length of pads, as well as other calculations. G.7.1. (Г.7.1).
2. The thickness and type of the membranes used in vacuum pulse casting have been confirmed, for obtaining of practically maximum pressurization of the mold, which increases, about two times, the degree of filling of casting mold. G.8.1, G.8.2. (Г.8.1, Г.8.2).
3. It has been established that the application of the "capillary molding" method for the production of two-layer casting molds using fusible models lowers the heating temperature of the casting mold by several hundred degrees, which leads to a lower process energy consumption, also to obtaining a mold free of cracks, unlike of conventional method of casting by fusible models. G.8.18 (Г.8.18).
4. The developed method for the production of MMCs with the ceramic reinforcing phase, applicable in the mining industry, ensures a stable mechanical connection between the matrix and the reinforcing phase, due to

the forced infiltration of the melt into the capillary spaces of reinforcing phase, which helps to overcome the surface tension of the melt and provides good wetting of the reinforcing phase. B.4.2, B.4.5.

5. A technology was created for the adhesive bonding of two types of PMCs with a matrix, composed of different resins, which leads to an increase in the complex properties of standard PMCs by combining the better properties of the two matrices. - B.4.9.
6. It has been, experimentally, determined the reasons for destruction of materials, used in the mechanical engineering and mining industry, based on which recommendations have been made to the manufacturer for quality control of the technological production process. - B.4.8, B.4.10.

6. Significance of contributions for science and practice.

The works of the applicant, presented for the contest are individual or collective. I know some of the co-authors and have no information about disputes in the collectives of the given works about authorship. I know the applicant's scientific output from reports at symposia, conferences and congresses on the subject of the contest. This gives me a reason to state that the applicant has equal participation in the works presented for the contest.

Eleven of the works are publications in editions, referenced and indexed in world renowned databases of scientific information. These editions do a plagiarism check. In the other works, presented for the contest, by the collectives are developed similar themes. All this gives me reason to exclude the possibility of plagiarism in the works of Chief Assistant PhD Daniela Todorova Spasova.

7. Critical notes and recommendations

I have no critical remarks, which to put under suspicion applicant's contributions.

I have two recommendations:

1. To strengthen the publication activity in refereed editions.
2. To participate in contests, on the subject, financed by the Fond of Scientific Research.

8. Personal impressions and opinion of the review.

I know Chief Assistant PhD Daniela Todorova Spasova for many years through the basic team she works with. She is an erudite specialist, persistent in her work, able to organize and conduct independently and in a team researches, enjoying authority among her colleagues. I would like to emphasize the candidate's ability to work in a team with specialists from other fields, an important condition for solving complex scientific and scientific-applied tasks.

CONCLUSION

Based on the acquaintance with the presented scientific works, their importance, the scientific applied and applied contributions contained in them, I find it reasonable to propose Chief Assistant PhD Eng. Daniela Todorova Spasova, to take the academic position "Associated Professor" in scientific field 5 Technical Sciences; professional direction 5.1. Mechanical Engineering; at the Faculty of Mechanical Engineering, Department of "Materials Science and Materials Technology", at the Technical University - Varna.

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REVIEW

Prof. PhD Eng. Angel

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