

## REPORT

to occupy the academic position:

"Professor"	X
"Associate Professor"	
	one of the academic positions indicated shall be marked with the sign "X"

**Candidates to occupy the position:**

1	Associate professor	PhD	Anna	Dyakova	Staneva	UCTM
№	academic position	scientific degree	name	middle name	last name	workplace

**Scientific area:**

5	Technical sciences
code	name

**Professional area:**

5.10	Chemical technologies
code	name

**Scientific specialty:**

"Technology of silicates, binders and refractory non-metallic materials"
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**The competition has been announced:**

36	13.05.2022	"Technology of the Silicates"	Faculty of Metallurgy and Materials Science
in SG issue	date	for the needs of the Department	Faculty

**The report was written by:**

Professor	PhD	Stoyko	Atanasov	Gyurov	IMSETHC-BAS
academic position	scientific degree	name	middle name	last name	workplace

**1. Report for the candidate:**

Associate professor	PhD	Anna	Dyakova	Staneva
academic position	scientific degree	name	middle name	last name

**1.1. Meeting the minimum requirements under the Regulations:**

A) The candidate meets the minimum requirements	20 points	X
B) The candidate doesn't meet the minimum requirements	0 points	
		one of the answers given is marked with the sign "X"

It must be filled in if answer B is marked. The publication activity of the candidate is analyzed. The response of the results achieved (quoted) is analyzed.

The points by indicators are: B Indicators 3 or 4 - 132.07; G Sum of indicators from 5 to 11 -239.43; D Sum of indicators from 12 to 15 – 1709; E Sum of indicators from 16 to end 364. Associate Professor Dr. Staneva participated in the competition with 45 (forty-five) publications, of which 37 (thirty-seven) in publications that are referenced and indexed in world-renowned databases with scientific information and 8 (eight) in non-refereed journals with scientific reviewing. The candidate's works have been cited 170 (one hundred and seventy) times, with 147 (one hundred and forty seven) being in journals that are referenced in global databases (Scopus) and 23 (twenty-three) in journals that are not referenced in global databases.

Associate Professor Dr. Staneva has successfully supervised one and participated in eight projects with national funding.

**1.2. Relevance of scientific and / or applied research:**

A) The research is relevant. Part of the research is pioneering (no results are known on the topic by other authors)	8 points	
B) Research is relevant. Results from other authors are known for each of the topics and / or applications studied.	6 points	X
C) Most of the research is relevant, but also some results are presented that have no scientific and / or applied value	4 points	
D) The smaller part of the research is relevant	2 points	
E) Research is not relevant	0 points	

		one of the answers given is marked with the sign "X"
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The evaluation of the relevance of the research must be substantiated.
<p>The candidate's research is in the following areas:</p> <p>1. Synthesis and characterization of graphene materials and composites with their participation [3, 4, 6, 7, 8, 9, 10, 15, 16, 17, 21, 22, 23, 24, 26, 27, 30, 31, 32, 33, 34, 35, 36, 39, 40, 41, 42].  Synthesis and characterization of graphene materials and nanocomposites with their participation is a modern hit in scientific research due to their unique properties.</p> <p>2. Preparation and characterization of glasses, glass-ceramic and ceramic materials [2, 29, 18, 20, 26, 37, 43, 44], in the systems: <math>\text{La}_2\text{O}_3\text{-Gd}_2\text{O}_3\text{-PbO-MnO-B}_2\text{O}_3</math> [2, 29], <math>\text{ZnO-WO}_3\text{-La}_2\text{O}_3\text{-Al}_2\text{O}_3</math> [18, 20], <math>\text{SiO}_2\text{-Bi}_2\text{O}_3\text{-TiO}_2</math> [26], <math>\text{Bi}_2\text{O}_3\text{-SiO}_2</math> [37], <math>\text{BaTiO}_3\text{/MgTiO}_3</math> [43], <math>\text{CaTiO}_3\text{/SrTiO}_3</math> [44].  Glass, glass ceramics and ceramic materials are the oldest synthetic materials used by humankind. Data on them have been accumulating for millennia, but regardless of this, research on the synthesis and properties of new types of glasses, glass ceramics and ceramics continues to be relevant and very intensive.</p> <p>3. Superconducting ceramic materials and composites based on them [1, 5, 11, 12, 28].  Superconducting ceramics are the most promising ceramic materials. They are extremely complex objects that have not been fully explored and are of great interest for both fundamental and applied research.</p> <p>4. Preparation and study of foam glass [13, 14, 19, 38].  Research to obtain new materials with a low thermal conductivity coefficient is particularly relevant today, due to the high cost of energy.</p>

**1.3. Objectives of the research:**

A) Realistic and of scientific and / or applied interest	8 points	X
B) Realistic, but not of scientific and / or applied interest	4 points	
C) Unattainable (unrealistic)	0 points	
		one of the answers given is marked with the sign "X"

Objectives must be specified. The type of the set objectives must be justified
<p>The main goals of the candidate's research are the synthesis of graphene materials and composites, new glasses, glass ceramics and ceramics, and the study of their properties. They are realistic and of scientific and/or applied interest. Scientific ones are related to creation of new methods of synthesis, glass formation, structural characteristics, physical and biological properties of the new materials. The applied ones are related to the improvement of the methods for the synthesis of new types of graphene materials and</p>

composites, glasses, glass ceramics and ceramics and studying the possibilities of their application in practice. There is great interest in the studied materials, as they possess properties that are promising for a variety of applications and opportunities for the development of new technologies.

#### 1.4. Candidate research contributions:

A) With lasting scientific and / or applied response, they form the basis for new research and applications	20 points	
B) They are of significant scientific and / or applied interest, complete and / or summarize previous research	16 points	
C) They are of scientific and / or applied interest	12 points	X
D) Lack of significant contributions	8 points	
E) Lack of contributions	0 points	
		one of the answers given is marked with the sign "X"

Contributions must be specified. The type of results achieved must be justified.

#### SCIENTIFIC AND SCIENTIFIC-APPLIED CONTRIBUTIONS:

- The possibility of using L-ascorbic acid instead of the highly toxic sodium borohydride for the reduction of graphene oxide in the synthesis of reduced graphene oxide has been demonstrated.
- Original data on the crystallographic structure of graphene sheets were obtained. The interplanar distance of reduced graphene oxide (RGO) - d 002 was found to be from 3.586 Å to 4.016 Å.
- A technological scheme has been developed for the synthesis of graphene composites in the system reduced graphene oxide -SiO<sub>2</sub> by using tetraethylorthosilicate (TEOS) with thermal stability up to 600°C, which is significantly higher than that of pure reduced graphene oxide (200°C).
- For the first time, composite materials were obtained in the RGO/glass system (glass - PbO-ZnO-B<sub>2</sub>O<sub>3</sub>) with thermal stability up to 600°C.
- The improved thermal stability of RGO/glass composites has been shown to be due to the fact that graphene sheets are embedded in the amorphous glassy matrix.
- A new method was developed to obtain graphene nanocomposites with the participation of Cu and Ag nanoparticles (RGO-Ag and RGO-Cu) by simultaneous reduction of GO, Cu<sup>2+</sup> and Ag<sup>+</sup> ions using zinc powder in aqueous acidic medium. The resulting composites consist of homogeneously distributed Cu and Ag nanoparticles on the surface of the graphene sheets.

- The new mixed RGO-Cu-Ag nanocomposites was found to exhibit good antibacterial activity against the bacteria Staphylococcus aureus, Escherichia coli and the fungus Candida albicans.
- Original compositions of graphene nanocomposites were developed and characterized: GO-ZnO; RGO-ZnO; RGO-ZnTiO<sub>3</sub>; RGO-Cu; GO-ZnO-Cu; GO-ZnO-Ag;
- It has been proven that directly, without additional heat treatment, glass-ceramic material can be obtained from a supercooled melt, containing phase (La<sub>1-x</sub>Gdx)<sub>1-y</sub>PbyMnO<sub>3</sub> in the form of small crystals embedded in the amorphous matrix.
- The region of glass formation in the ZnO-WO<sub>3</sub>-La<sub>2</sub>O<sub>3</sub>-Al<sub>2</sub>O<sub>3</sub> system is determined.
- Data were obtained on the glass formation in the WO<sub>3</sub>-ZnO-Nd<sub>2</sub>O<sub>3</sub>-Al<sub>2</sub>O<sub>3</sub> system by high-speed cooling of melts.
- Data were obtained on the influence of heat treatment on the phase transformation and magnetic properties of superconducting composites with the participation of Bi<sub>1.6</sub>Pb<sub>0.4</sub>Sr<sub>2</sub>Ca<sub>2</sub>Cu<sub>3</sub>O<sub>z</sub> and La<sub>0.6</sub>Pb<sub>0.4</sub>MnO<sub>3</sub> phases.
- It has been proven that part of the ferromagnetic phase La<sub>0.6</sub>Pb<sub>0.4</sub>MnO<sub>3</sub> transforms into a more complex solid solution, with the general formula La(1-15x-y)Pbx(Sr,Ca)yMn1-zCuzO<sub>3</sub>.
- All obtained composites possess superconducting properties below the critical temperature of the superconducting transition and transition to a ferromagnetic state above the Curie temperature (TK).
- A technology has been developed for the production of a continuous strip of foam glass by utilizing waste glass crumb.
- The possibility of obtaining colored foam glass from waste glasses has been proven.

**1.5. Participation of the candidate in the achievement of the presented results:**

A) The candidate has at least an equal participation in the submitted papers	8 points	X
B) The candidate has at least an equal participation in most of the submitted papers	7 points	
C) The candidate has a secondary participation in most of the submitted papers	4 points	
D) The candidate participation is unnoticeable	0 points	
		one of the answers given is marked with the sign "X"

Associate Professor PhD Staneva is in first place in 7 (seven) works presented in the competition, in 10 (ten) works she is in second place. Due to the lack of separation protocols, I assume that the candidate has at least equal participation in the works presented.

Publications in journals that are referenced and indexed in world-renowned databases of scientific information (37 (thirty-seven) in number for the competition) are automatically

checked for plagiarism and this excludes the possibility of using other people's results. I exclude the possibility of plagiarism in the works of Assoc. Dr. Staneva.

### 1.6 Pedagogical activity:

A) The candidate has effective and sufficient pedagogical activity at the university. The textbooks issued are modern and useful (they meet the requirements of the Regulations). The work with undergraduate and doctoral students is at a high professional level.	8 points	X
B) The candidate has sufficient pedagogical activity at the university. The textbooks issued satisfy the requirements of the Regulations.	6 points	
C) The pedagogical activity and / or textbooks issued are insufficient (do not meet the requirements of the Regulations)	0 points	
		one of the answers given is marked with the sign "X"

Critical notes must be provided if one of the items B or C is marked.

### 1.7. Critical notes:

A) Lack of critical notes	8 points	X
B) Critical notes of a technical nature	7 points	
C) Critical notes that would partially improve the results achieved in a small part of the research	5 points	
D) Critical notes that would partially improve the results achieved in most of the research	3 points	
E) Significant critical notes	0 points	
		one of the answers given is marked with the sign "X"

Critical notes must be provided if one of the answers C, D or E is marked.

### 1.8. Conclusion

A) The evaluation of the candidate's activity is <b>POSITIVE</b>	This evaluation is assigned to a total number of at least 50 points	70
B) The evaluation of the candidate's activity is <b>NEGATIVE</b>	This evaluation is assigned to a total number below 50 points	
		one of the answers given is marked with the sign "X"

To be filled in if requested by the member of the scientific jury
The materials presented in the competition convinced me that Associate Professor Dr. Anna Dyakova Staneva is a well-rounded scientist who maintains high standards of scientific, applied and pedagogical activity. She fully complies with the requirements of the ZRASRB, as well as the rules of the HTMU for holding the academic position "Professor". I give a positive evaluation for the election of Assoc. Dr. Anna Dyakova Staneva as "Professor" in the Department of "Technology of the Silicates" of UCTM in the scientific specialty "Technology of silicates, binders and hard-to-melt non-metallic materials".

<b>02.08.2022</b>	The report was written by:	
date	<b>Professor PhD Stoyko Atanasov Gyurov</b>	signature